Test Equipment Depot
1-800-517-8431
99 Washington Street
Melrose, MA 02176
Fax 781-665-0780
TestEquipmentDepot.com

TABLE OF CONTENTS

1 GENERAL 1
1.1 Description 1
1.2 Specifications 4

2 SAFETY RULES 11
2.1 General safety rules 11
2.2 Descriptive Examples of Over-Voltage Categories 13

3 INSTALLATION 15
3.1 Power Supply 15
3.1.1 Operation using the External DC Charger 15
3.1.2 Operation using the Battery 15
3.1.2.1 Battery Charging 16
3.2 Installation and Start-up 16

4 OPERATING INSTRUCTIONS 17
4.1 Description of the Controls and Elements 17
4.2 Adjustment of Volume and Monitor Parameters 26
4.3 Selecting the Operation Mode: TV / Spectrum Analyser 26
4.4 RF Band Selection: 5-862 MHz / 900-2150 MHz 26
4.5 Channel Tuning / Frequency Tuning 27
4.6 Automatic Transmission Search 27
4.7 Selecting Analogue / Digital Mode 28
4.8 External Units Power Supply (EXT. SUPPLY) 28
4.9 TV Operating Mode 29
4.9.1 Selecting the Measurement Mode (MEASURE) 29
4.9.1.1 Measuring the Video Carrier Level *(Level)* 32
4.9.1.1.1 Changing the measurement information format 32
4.9.1.1.2 Selecting TV Mode: TV, LV, SY (TV MODE) 33
4.9.1.2 Measuring the Video / Audio Ratio (V/A) 35
4.9.1.3 Measuring the Carrier / Noise Ratio (C/N) 35
4.9.1.4 Measuring the Power of Digital Channels *(Channel power)* 37
4.9.1.5 BER measurement mode selection 39
4.9.1.5.1 Measuring BER of QAM Digital Channels DVB-C (QAM) 40
4.9.1.5.2 Measuring BER of COFDM Digital Channels DVB-T (COFDM) 43
4.9.1.5.3 Measuring BER of QPSK Digital Channels DVB-S (QPSK) 48
4.9.1.5.4 Measuring Wrong Packets of TS MPEG-2 (W.P.) 51
4.9.1.5.5 QAM Constellation Diagram 53
4.9.1.5.6 COFDM Constellation Diagram 56
4.9.1.6 Digital audio broadcasting measurement (DAB) 57
4.9.2 DVB Channels Identifier: DCI function 61
4.9.3 Decoding MPEG-2 / DVB Channels, access to Digital Services. 63

English

4.9.4 TV Mode Functions Menu 68
4.9.4.1 Selection of the RF Band: (*Band switching*) 69
4.9.4.2 Selection of the TV System and Standard (*System & Standard*) 69
4.9.4.3 Battery and External Units Power Supply *(BATTERY & LNB)* 70
4.9.4.4 Datalogger Function 71
4.9.4.4.1 Configuring the Datalogger Function. 71
4.9.4.4.2 Selecting the Measurement to be Taken 74
4.9.4.4.3 Taking Measurements 75
4.9.4.4.4 Exiting the Datalogger Function 76
4.9.4.4.5 Example of Datalogger Function Applications. 76
4.9.4.5 Clock 77
4.9.4.6 Input Video 77
4.9.4.7 Selecting the Channels Table (*Channel set*) 78
4.9.4.8 Measurement Units 78
4.9.4.9 Power Off Mode (*Manual power*) 78
4.9.4.10 C/N setup 78
4.9.4.11 Channel Bandwidth *(Channel BW)* 79
4.9.4.12 LNB Local Oscillator Frequency *(Lnb local osc)* 79
4.9.4.13 Video Polarity 79
4.9.4.14 Verification of distribution networks (*SAT IF Test*) 80
4.9.4.15 Verification of Wi-Fi systems (*Wi - Fi*) 82
4.9.4.16 Input TS 84
4.9.4.17 NICAM Channel 85
4.9.4.18 Search Level 85
4.9.4.19 Teletext 85
4.9.4.20 DiSEqC Command Generator 85
4.9.4.21 Beep 89
4.9.4.22 Equipment Information 89
4.9.4.23 Exit 89
4.10 Spectrum Analyser Operating Mode 89
4.10.1 Spectrum Analyser Mode Functions Menu 90
4.10.1.1 Band Switching 91
4.10.1.2 Span 91
4.10.1.3 Reference Level 91
4.10.1.4 Dynamic Range 92
4.10.1.5 Dual Marker/Single Marker 92
4.10.1.6 Sweep 92
4.10.1.7 Reference Noise (Carrier ➔ Ref. Noise) 93
4.10.1.8 Channel Bandwidth (Marker ➔ Channel BW) 93
4.10.1.9 Marker (Channel BW ➔Marker) 93
4.10.1.10 Carrier (Ref. Noise ➔ Carrier) 93
4.10.1.11 Bandwidth of the Spectrum Measuring Filter *(Measure bandwidth)* .. 93
4.10.1.12 Acquisition mode 94
4.10.1.13 Detection mode 94
4.10.1.14 Selecting the Channels Table *(CHANNEL SET)* 94
4.10.1.15 Batteries and External Units Power Supply *(BATTERY & LNB)* 94
4.10.1.16 Exit 94

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176
FAX 781.665.0780 - TestEquipmentDepot.com

4.10.2 Selecting the Measurement Mode 94
4.10.2.1 Measuring Carrier Levels *(Level)* 95
4.10.2.2 Measuring the Carrier / Noise ratio (*C/N Referenced*) 95
4.10.2.3 Measuring the Power of Digital Channels *(Channel Power)* 96
4.11 Selecting the Sound Mode (SOUND) 97
4.11.1 FM function, access to RDS service 98
4.11.2 Tone function 99
4.11.3 Selecting NICAM sound 99
4.12 Measurement Configuration Memories 100
4.12.1 Storing a Measurement Configuration *(STORE)* 100
4.12.2 Retrieving a Configuration *(RECALL)* 102
4.13 Direct Access to Functions 102
4.14 Printing the Spectrum, the Measurements and Memories 103
4.14.1 Handshake and Control Lines 105
4.14.2 CI-23 set-up 106

5 DESCRIPTION OF THE INPUTS AND OUTPUTS 107
5.1 RF input 107
5.2 RS-232C serial port 107
5.3 Parallel Input Connector (LVDS D-25) 107
5.4 Parallel Output Connector (LVDS D-25) 108
5.5 Scart (DIN EN 50049) 109
5.6 Connector for CAM modules and SMART-Cards 110

6 MAINTENANCE 113
6.1 Considerations about the Screen *(model PROLINK-4C Premium)* 113
6.2 Internal fuses which user cannot replace 113
6.3 Replacing the Battery 114
6.4 Cleaning Recommendations 115

English

ADVANCED
DIGITAL TV & SAT LEVEL METER
PROLINK-4/4C *Premium*

1 GENERAL

1.1 Description

The result of uniting PROMAX ELECTRONICA's long experience in the design of TV signal analysers with the latest in technological progress, the **PROLINK-4/4C *Premium*** brings together the functions installers seek most, all in one **small**, **light-weight**, portable instrument.

Special attention has been given to creating a level meter that has advanced features, but which is also **easy to use**. Three features in particular are a result of this: a universal keyboard, each function represented by a graphic icon, so that after a brief period of introduction to the instrument, access to any function becomes almost intuitive. Secondly, the meter has been entirely designed as an *On Screen Display* (OSD) instrument so that, when a function is selected, it appears on the monitor listing all the various parameters the user has chosen. Finally, there is a rotary selector-button used for navigation across the different on-screen menus, to alter parameters and to validate them at the touch of a button.

The range of frequencies covered, from 5 to 862 MHz and from 900 to 2150 MHz, makes **PROLINK-4/4C *Premium*** an excellent instrument for **FM radio**, **digital radio (DAB), terrestrial TV** (**MATV** 'Master Antenna Television'), **cable TV** (**CATV**, 'Community Antenna Television', where the subband tuning margin, from 5 to 45 MHz, enables the user to carry out tests on the return channel), **satellite TV**, **MMDS microwave links**, **VSAT** ('Very Small Aperture Terminal') **systems, digital TV** and **Wi-Fi.** Furthermore, its high resolution frequency, **50 kHz**, makes FM measurements much easier.

English

[1] Digital Video Broadcasting *Trade Mark of the DVB Digital Video Broadcasting Project (2301)*

The **PROLINK-4/4C *Premium* includes the main TV standards: M, N, B, G, I, D, K and L,** adopting, apart from the characteristic parameters of the standard, the correcting automatic system to obtain in all the cases an accurate measuring of the input signal level. It admits any TV system (**PAL**, **SECAM** and **NTSC**) and allows the user to work directly with **digital TV** signals decoding them, so that the television image may be viewed, and directly measuring the power, carrier/noise ratio (**C/N**), the bit error rate (**BER**) and the modulation error ratio (**MER**) of the digital signals. It is also capable of analysing the **MPEG-2 / DVB Transport Stream** and identifying received **Wrong Packets**. The **PROLINK-4/4C *Premium*** allows to obtain as much a graphical representation of the **Constellation Diagram** for **DVB-C (QAM)** as **DVB-T (COFDM)** signals. Being a multistandard instrument, it can be efficiently used in any country of the world. Its accuracy and reliability meet the needs of the most demanding users.

A powerful microprocessor automatically handles a large part of the operations necessary to optimise the process of measurement; for example, continuous frequency synthesis, measurement correction, the appropriate selection of the attenuators and the automatic cut-off after the device has been inactive for a certain period of time.

The signal level measured is indicated numerically in absolute values and, optionally, on an analogue bar shown superimposed on the monitor image, that facilitates the detection of the maximum level. Moreover, in the LV sound mode, the loudspeaker emits a tone whose frequency depends on the level of the signal received, which is very useful when installing antennas. It is also possible to display on screen the line synchronism pulse like on an oscilloscope screen.

The **Spectrum Analyser** mode enables all the signals on a band to be viewed on the monitor at the same time to measure analogue channels level, C/N ratio referenced to a noise frequency defined by the user and digital channels power using an integration method. The bandwidth of the measuring filter can be modified to improve frequency resolution. This is an indispensable feature, as high channel density is present on all transmission systems today. Spectrum display can be varied between full span (the entire band) and 8 MHz terrestrial or 4 MHz satellite. In addition, there are two markers in order to locate and list frequencies, to read signal level and frequency difference, and the level between both.

In the satellite band, the **PROLINK-4/4C *Premium*** incorporates a new function for the analysis of the narrow band signals. Il offers two additional **span** levels of 8 MHz and 4 MHz with a resolution of 50 kHz.

All functionality in spectral mode has been improved adding the possibility of extending the graphical presentation vertically. With this aim a new function has been introduced that allows to set a variable **Dynamic Range** from 10-5-2 dB/div.

The **PROLINK-4/4C *Premium*** incorporates a specific function to test satellite signals distribution networks. The use in combination with a **IF** generator allows to carry out an easy verification of the installations before the operation beginning. Also it includes a function specially designed for the analysis of the wireless communication networks **Wi-Fi** (Wireless Fidelity) that works in the **ISM** (Industrial Scientific and Medical) band from 2400 to 2483.5 MHz.

The selection of sound subcarrier is automatic, depending on the standard, or tunable between 4 and 9 MHz. When decoding TV sound it is possible to choose between the **NARROW** and **WIDE** filter to obtain the best carrier discrimination. It includes a **NICAM** decoder (with BER measurement); the possibility to commute the channel that is delivered to the loudspeaker enables the user to check the sound stereo and dual. Also it allows to access to the associated information to the **FM** transmissions that incorporate the radio data system (**RDS**).

The equipment incorporates a specific module for the measurement of digital radio signals based on **DAB** (Digital Audio Broadcasting) technology, that allows the tuning and to monitoring of **DAB** signals, as well as to measure the parameters related to the signal quality and to display data and information related to the received signal.

To enhance its convenience of use, it has **99 memories** to store the different measuring configurations: name of the configuration, frequency, TV system, type of measurement, external units powering, units of measurement and sound. Moreover, the **DATALOGGER** function permits the acquisition and storage of up to **9801 measures** (99 configurations x 99 points of measure) that makes it much easier to test systems in which a large number of measurements have to be made, and enables further processing of all the information acquired.

Also, the level meter incorporates the **teletext** function, a **DiSEqC**[2] command generator and permits to supply different voltages to the external unit (**13 V / 15 V / 18 V / 24 V** terrestrial TV, and **13 V / 15 V / 18 V / 13 V + 22 kHz / 15 V + 22 kHz / 18 V + 22 kHz** satellite TV).

Furthermore, the instrument comes with two parallel **LVDS DVB-PI** connectors for the input and output of *Transport Stream* signals, a connector for **CAM** modules (PC-Card) that allows the insertion of subscriber conditional access cards and a **EUROCONNECTOR**, or Scart connector, for audio/video input/output.

The **PROLINK-4/4C *Premium*** is powered by rechargeable battery or connected to the mains through the supplied external DC power charger.

It also incorporates a **RS-232C** interface which enables the user to connect the instrument to a PC for data recording, remote-control of the instrument and to a printer in order to print out the measurements.

English

[2] *DiSEqC™ is a trademark of EUTELSAT.*

1.2 Specifications ⚠

CONFIGURATION FOR MEASURING LEVEL AND POWER

TUNING	Digital frequency synthesis. Continuous tuning from 5 to 862 MHz and from 900 to 2150 MHz
Tuning modes	Frequency, Channel or Memory. Channel plan configurable on demand
Resolution	5-862 MHz: 50 kHz 900-2150 MHz: 500 kHz (span FULL-500-200-100-50-32-16 MHz) 50 kHz (span 10-5 MHz)
Automatic search	Threshold level selectable
Memory	99 positions for measurement configurations

RF INPUT	
Impedance	75 Ω
Connector	Universal, with BNC or F adapter
Maximum signal	130 dBµV
Maximum input voltage	
DC to 100 Hz	50 V rms (powered by the AL-103 power charger) 30 V rms (not powered by the AL-103 power charger)
5 MHz to 2150 MHz	130 dBµV

LEVEL MEASUREMENT	
Measurement range	
Terrestrial TV & FM bands	20 dBµV to 120 dBµV (10 µV to 1 V)
Satellite TV band	30 dBµV to 120 dBµV (31.6 µV to 1 V)
Reading	Auto-range, reading is displayed on an OSD window
Digital	Absolute value calibrated in dBµV, dBmV or dBm
Analogue	Relative value through an analogue bar on the screen
Measurement bandwidth	230 kHz (Terrestrial band) ' 4 MHz (Satellite band) (maximum band ripple 1 dB).
Audible indicator	LV audio. A tone with pitch proportional to signal strength.
Accuracy	
Sub-band	± 1.5 dB (30-120 dBµV, 5-45 MHz) (22 °C ± 5 °C)
Terrestrial bands	± 1.5 dB (30-120 dBµV, 48.25-861 MHz) (22 °C ± 5 °C)
Satellite band	± 1.5 dB (40-100 dBµV, 900-2150 MHz) (22 °C ± 5 °C)
Overrange indication	↑, ↓

MEASUREMENTS IN TV MODE	
Terrestrial bands	
Analogue channels	Level, Video-Audio ratio and Carrier-Noise ratio (Auto and Referenced).
Digital channels	Channel power (Auto) and Carrier-Noise ratio (Auto and Referenced).

Satellite band

Analogue channels	Level and Carrier-Noise ratio (Auto and Referenced)
Digital channels	Channel power (Auto) and Carrier-Noise ratio (Auto and Referenced).
DATALOGGER function	Automatic acquisition of up to 9801 measurements

SPECTRUM ANALYSER MODE

Satellite band	20 dBµV to 120 dBµV (10 µV to 1 V)
Terrestrial bands	20 dBµV to 120 dBµV (10 µV to 1 V)
Measurement bandwidth	
Terrestrial	50 kHz, 230 kHz, 1 MHz selectable
Satellite	50 kHz, 230 kHz, 4 MHz selectable
Span	
Terrestrial	*Full span* (full band), 500, 200, 100, 50, 32, 16, 8 MHz selectable.
Satellite	*Full span* (full band), 500, 200, 100, 50, 32, 16, 10, 5 MHz selectable.
Markers	2 with level, frequency, level difference and frequency difference indications.
Detection	By peak or average.
Measurements	
Terrestrial bands	
Analogue channels	Level and Carrier-Noise ratio (Referenced)
Digital channels	Channel power (Integration method) and Carrier-Noise ratio (Referenced).
Satellite band	
Analogue channels	Level and Carrier-Noise rate (Referenced)
Digital channels	Channel power (Integration method) and Carrier-Noise ratio (Referenced).

MONITOR DISPLAY

Monitor	TFT colour 5 inches (**PROLINK-4C *Premium***) or B & W 4 ½ inches (**PROLINK-4 *Premium***).
Colour system	PAL, SECAM and NTSC
TV standard	M, N, B, G, I, D, K and L
Synchronism and Burst	Graphic representation over the picture
Spectrum mode	Variable span, dynamic range and reference level
Sensibility	40 dBµV for correct synchronism
Synchronism 50/60 Hz	Automatic selection according to the system

VIDEO SIGNAL

External video input	Scart (automatic or selectable)
Sensibility	1 Vpp (75Ω) positive video
Video output	Scart (75Ω)

SOUND

Input	Scart
Outputs	Built in speaker, Scart

English

Demodulation	AM, FM, TV and NICAM (for PAL B/G, PAL I and SECAM L standards), selectable
De-emphasis	50 µs
Subcarrier	Digital frequency synthesis
Variable	From 4 to 9 MHz, 10 kHz resolution
Fixed	
Terrestrial	According to the active standard: 4.50 - 5.50 - 5.74 - 6.00 - 6.26 - 6.50 - AM - FM - LV - OFF.
Satellite	5.80 - 6.50 - 6.65 - 6.80 - 7.02 - LV - OFF

CONFIGURATION FOR MEASURING DIGITAL PARAMETERS

TUNING:	
COFDM:	from 40 to 862 MHz.
Resolution:	166 kHz (BW = 8 MHz) / 125 kHz (BW = 7 MHz and 6 MHz).
QAM:	from 47 MHz to 862 MHz.
Resolution:	50 kHz.
QPSK:	from 950 MHz to 2150 MHz.
Resolution:	500 kHz.
DAB:	Terrestrial band - III from 174 to 240 MHz (channels 5A to 13F)
Decoding:	Transmission modes 1, 2, 3 and 4 (ETS 300 401)
LEVEL RANGE	
COFDM:	45 dBµV to 100 dBµV.
QAM:	45 dBµV to 110 dBµV.
QPSK:	44 dBµV to 114 dBµV.
IMPEDANCE	75 Ω
MEASUREMENTS	
COFDM:	
Parameters:	BER after Viterbi. BER before FEC (Forward Error Correction). MER selectable and Constellation Diagram. CSI (Channel Status Information) selectable. Qualitative measurement about channel quality. Measures from 0 to 100 %. 0 % value corresponds to maximum quality.
Presentation:	Numeric and level bar. Graph (Constellation).
QAM:	
Parameters:	BER before FEC (Forward Error Correction). MER (Modulation Error Ratio) and Constellation Diagram.
Presentation:	Numeric and level bar. Graph (Constellation).

QPSK:

Parameters:	BER before FEC. BER after Viterbi. MER selectable.
Presentation:	Numeric and level bar.
WRONG PACKETS	Number of non-correctable packets accumulated during the measurement time, and indicates when the fault was produced. Identification according to levels 1.1, 1.2, 1.3 and 2.1 of TR 101 290 ETSI standard.

DCI FUNCTION	DVB channel identifier. Provides information on the channel whose BER is being measured.

COFDM SIGNAL PARAMETERS

Carriers	2k / 8k (Selected by the user).
Guard Interval	1/4, 1/8, 1/16, 1/32 (Selected by the user).
Code Rate	1/2, 2/3, 3/4, 5/6, 7/8.
Modulation	QPSK, 16-QAM, 64-QAM.
Spectral inversion	Selectable: ON, OFF.
Hierarchy	Indicates hierarchy mode.
FEC	Reed-Solomon (204, 188) and Viterbi.

QAM SIGNAL PARAMETERS

Demodulation	16/32/64/128/256 QAM.
Simbol rate	1000 to 7000 kbauds.
Carrier frequency deviation	±0.08 x Symbol rate.
Roll-off (α) factor of Nyquist filter	0.15.
Spectral inversion	Selectable: ON, OFF

QPSK SIGNAL PARAMETERS

Bandwidth IQ signals	variable: 10 MHz to 30 MHz in 2.5 MHz steps.
Simbol rate	2 to 45 Mbauds.
Carrier frequency deviation	±0.05 x Symbol rate.
Roll-off (α) factor of Nyquist filter	0.35.
Code Rate	1/2, 2/3, 3/4, 5/6, 7/8 and AUTO.
Spectral Inversion	Selectable: ON, OFF

VIDEO

Format	MPEG-2 / DVB (MP@ML).
Conditional access types	Common interface, according to available user CAM. (Patent pending). Uncoded FTA standard.

English

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176

FAX 781.665.0780 - TestEquipmentDepot.com

BASE BAND SIGNAL

Transport Stream	
Interface	DVB-PI
Maximum frequency	50 Mb/s
Output	parallel LVDS. D-25 Connector
Amplitude (differential)	
Maximum	450 mV.
Minimum	250 mV.
Input	parallel LVDS. D-25 Connector
Amplitude (differential)	
Minimum	100 mVpp.

TELETEXT Decodes at 1.5 level

RS-232C INTERFACE

EXTERNAL UNITS POWER SUPPLY Through the RF input connector

Terrestrial	External or 13/15/18/24 V
Satellite	External or 13/15/18 V
22 kHz signal	Selectable
Voltage	0.6 V ± 0.2 V
Frequency	22 kHz ± 4 kHz
Maximum power	5 W

DiSEqC[3] GENERATOR According to DiSEqC 1.2 standard

POWER SUPPLY

Internal	
Batteries	7.2 V 13 Ah Li-Ion battery
Autonomy	> 2 hours in continuous mode.
Recharging time	4 hours starting of completely discharged (instrument off).
External	
Voltage	12 V
Consumption	51 W
Auto power off	After 15 minutes without operating on any control. Deactivable.

OPERATING ENVIRONMENTAL CONDITIONS

Altitude	Up to 2000 m
Temperature range	From 5 to 40 °C (Automatic disconnection by excess of temperature).
Max. relative humidity	80 % (up to 31 °C), decreasing lineally up to 50% at 40 °C.

[3] DiSEqC™ is a trademark of EUTELSAT.

MECHANICAL FEATURES

Dimensions	294 (W) x 106 (H) x 274 (D) mm (without holster)
Weight	5 kg

INCLUDED ACCESSORIES

1x CB-044	Rechargeable Li+ battery 7.2 V, 13 Ah
1x AD-055	"F"/F-BNC/F adapter
1x AD-056	"F"/F-"DIN"/F adapter
1x AD-057	"F"/F-"F"/F adapter
1x AL-103	External DC charger
1x DC-261	Carrying bag
1x AA-103	Car lighter charger
1x CA-005	Mains cord

OPTIONAL ACCESSORIES

CI-23	Portable printer
RM-104	Remote control software
RM-204	Monitoring and alarm software
RM-304	Monitoring and alarm system via SMS
RP-050	IF simulator for TCI tests
CV-245	Wi-Fi band converter
TI-125	DC converter to power supply DVB-T antennas

English

2 SAFETY RULES

2.1 General safety rules

* Use this equipment connected **only to systems with their negative of measurement connected to ground potential**.

* The **AL-103** external DC charger is a **Class I** equipment, for safety reasons plug it to a supply line with the corresponding **ground terminal**.

* This equipment can be used in **Overvoltage Category I** installations and **Pollution Degree 2** environments.
  External DC charger can be used in **Overvoltage Category II**, installation and **Pollution Degree 1** environments**.**

* When using some of the following accessories **use only the specified ones** to ensure safety.
  Rechargeable battery
  External DC charger
  Car lighter charger cable

* Observe all **specified ratings** both of supply and measurement.

* Remember that voltages higher than **60 V DC** or **30 V AC rms** are dangerous.

* Use this instrument under the **specified environmental conditions**.

* **The user is only authorized to** carry out the following maintenance operations:
  Battery replacement

  On the Maintenance paragraph the proper instructions are given.
  Any other change on the equipment should be carried out by qualified personnel.

* When using the power adaptor, the **negative of measurement** is at ground potential.

* **Do not obstruct the ventilation system** of the instrument.

* Use for the signal inputs/outputs, specially when working with high levels, appropriate low radiation cables.

* Follow the **cleaning instructions** described in the Maintenance paragraph.

English

* Symbols related with safety:

DIRECT CURRENT

ALTERNATING CURRENT

DIRECT AND ALTERNATING

GROUND TERMINAL

PROTECTIVE CONDUCTOR

FRAME TERMINAL

EQUIPOTENTIALITY

ON (Supply)

OFF (Supply)

DOUBLE INSULATION
(Class II Protection)

CAUTION
(Risk of electric shock)

CAUTION REFER TO MANUAL

FUSE

2.2 Descriptive Examples of Over-Voltage Categories

Cat I Low voltage installations isolated from the mains

Cat II Portable domestic installations

Cat III Fixed domestic installations

Cat IV Industrial installations

3 INSTALLATION

3.1 Power Supply

The **PROLINK-4/4C *Premium*** is a portable instrument powered by one 7.2 V - 13 Ah Li-Ion battery. There is also an external DC charger provided for mains connection and battery charging.

3.1.1 Operation using the External DC Charger

Connect the external DC charger to **EXT. SUPPLY** [38] on the **PROLINK-4/4C *Premium*** side panel. Connect the DC charger to the mains. Then, press the **PROLINK-4/4C *Premium*** on/off key [1]. The level meter is now in operation and the battery is slowly charged. When the instrument is connected to the mains, the **CHARGER** indicator [7] remains lit.

3.1.2 Operation using the Battery

For the device to operate on the battery, disconnect the power cable and press the on/off key [1]. The fully charged battery can power the equipment for more than 2 hour non-stop.

If battery is very weak, the battery cut-off circuit will prevent the device from functioning at the same time the beeper will be heard. In such a situation battery must be recharged immediately.

Before taking any measurements, you have to check the charge state of the battery by checking the battery charge level indicator **BATTERY** [8] on the front panel, or **Battery & Lnb** function on the TV mode functions menu (see section '*4.9.4.3 Batteries and External Units Power Supply*').

The **BATTERY** [8] led indicates, whenever the equipment is off and connected to the external DC charger, in a qualitative manner the battery charge condition. For battery charge levels close to 100% it remains lit in green colour; for charge level higher to 50% it remains amber and it appears in red to indicate the empty battery condition. When the instrument indicates a Low Battery (led lit in red colour) the battery must be charged immediately. When the low battery level is reached, the monitor momentarily displays the message VERY LOW BATTERY and the beeper sounds.

English

3.1.2.1 Battery Charging

To fully charge the battery, connect the instrument to the external DC charger **without pressing** the on/off key [1]. The length of time it takes to recharge it depends on the condition of the battery. If they are very low the recharging period is about 4 hours. The **CHARGER** [7] indicator should remain lit in amber colour.

When the battery charging process is completed with the instrument off, the fan stops.

IMPORTANT

The instrument battery needs to be kept charged between 30% and 50% of its capacity when not in use. The battery needs to be fully charged for best results. A fully charged battery suffers temperature-related discharge. For example, at a room temperature of 20 ºC, it can lose up to 10% of its charge over 12 months.

3.2 Installation and Start-up

The **PROLINK-4/4C *Premium*** level meter is designed for use as a portable device.

When the [1] key is pressed, the instrument is in the *automatic power-off* mode; that is, the device is automatically disconnected fifteen minutes after the last time a key has been pressed. When turning on the unit, automatic power-off mode may be deactivated by holding down the [1] key until you hear two acoustic indications, later "**MANUAL POWER**" message will appear on the lower side of the monitor. When the device is operating, it is also possible to select the manual power-off mode by means of the ***Manual power*** function of the TV functions menu.

4 OPERATING INSTRUCTIONS

4.1 Description of the Controls and Elements

Front panel

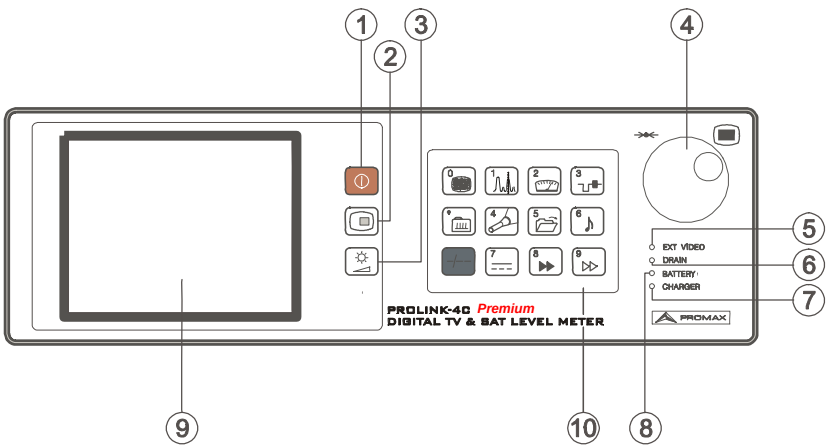

Figure 1.- Front panel

[1]

On / Off key. This turns on the instrument, and the user can select either manual or automatic power-off.

[2]

OSD key. Enables the measurement information format displayed on-screen in TV mode (level measurement, digital TV, DAB...) to be selected.
It allows also to visualize the TV image corresponding to the input digital signal.
Activation / deactivation of teletext **Zoom** function.
Activation / deactivation of constellation **Zoom** function.

[3]

Activation of **VOLUME, CONTRAST, BRIGHTNESS (**models **PROLINK-4/4C *Premium*), SATURATION** and **HUE** (for models **PROLINK-4C *Premium*** andthis last only for NTSC colour system) control menus.

[4] **Rotary selector-button**. This has many different functions: tuning control, moving between the various on-screen menus and sub-menus, and validation of the different options.

English

Tuning purposes: turning it clockwise frequency increases while turning it anticlockwise frequency decreases.

To **shift along the on-screen menus**: turning it clockwise active option moves downwards while turning it anticlockwise active option moves upwards.

In **TV mode**, press the rotary selector-button to display the first sub-menu containing different functions, some are dependent on the band and the standard:

Band switching	Permits to change from terrestrial (5-862 MHz) to satellite band (900-2150 MHz) and vice versa.
System & Standard	Selects the colour system (**PAL**, **SECAM** or **NTSC**) and the TV standard (**B/G**, **D/K**, **I**, **L**, **M**, **N** or **Digital**).
Battery & Lnb	Displays battery voltage and external units power supply voltage and current (**V Ext** and **I Ext**).
Channel set	Selects active channels table.
Channel BW	(Satellite band or digital channels). Defines channel bandwidth. Indispensable for measuring digital channels and satellite band channel C/N.
Teletext	Sets teletext information.
DiSEqC	(Only satellite channels). Defines a sequence of DiSEqC commands and permits to send them.
Reference noise	(Only in *C/N Reference noise* mode). Defines the frequency where measure the noise level.

Press **Next** for the second sub-menu:

Datalogger	Permits to acquire and to store up to 9801 measurements automatically.
Sat IF Test	(Only satellite band, analogue channels). This selects the function for testing satellite distribution networks.
Wi-Fi	(Only in satellite band). This selects the function for testing wireless communication networks.
Input Video	Enables Scart commutation signals to be activated, deactivated or set to automatic/subordinate mode.
C/N setup	Defines the C/N measuring method between *Auto* or *Referenced*.
Nicam channel	(Only analogue channels). This selects the NICAM sound channel that is sent to the loudspeaker.
Search level	Selects the threshold level of the automatic station search function.

Lnb local osc (Only satellite band). It defines the frequency of the local oscillator (L.O.) of the LNB.

Video polarity (Only satellite band, analogue channels). This selects the polarisation of the video carrier.

Press **Previous** for the first sub-menu or **Next** to access the third one:

Clock Displays time and date, and allows them to be modified.

Units Selects the measuring units: *dBµV*, *dBmV* or *dBm*.

Manual power Sets power-off as *Manual* or *Automatic*.

Language Selects the language between DEUTSCH, ENGLISH, ESPAÑOL, FRANÇAIS, and ITALIANO. Should you have accidentally chosen the wrong language, you can return automatically to the language menu by means the reset process.

Beep Activates (ON) / deactivates (OFF) the beeper.

Initial screen It shows a logo of the manufacturer as well as basic information about the instrument description (version, manufacturer and model).

Equipment info. Displays information on the instrument: serial number, version of control software, included set-up, etc.

Exit Exits from the function menu.

Finally, press **Previous** for the second sub-menu or **Exit** to quit the function menu.

IMPORTANT REMARK

In case of erroneous selection of a language, the user must follow the following steps to accede again to the language selection menu (Language, Idioma, Sprache, Lingua o Langue):

From the TV mode, press the rotary selector, it will appear the first sub-menu of functions *(Functions, Funciones, Funktionen, Funzioni, Fonctions)*, turn the rotary selector to move the cursor to the position (**Next**, **Siguiente**, **Nächst**, **Seguente** or **Suivant**) and press it to accede again to the second sub-menu. Repeat the operation to accede to the third sub-menu. Finally, move the cursor to the fourth line of the sub-menu and press the rotary selector to accede to the language selection menu.

Also you can access to the language selection menu activating the reset process, for it the reset button [36] must be pressed when the instrument is off.

English

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176
FAX 781.665.0780 - TestEquipmentDepot.com

In **Spectrum Analyser mode,** the first sub-menu displays the following functions:

Band switching Permits to switch from terrestrial (5-862 MHz) to satellite band (900-2150 MHz) and vice versa.

Span Defines the frequency range displayed between **Full** (the entire band), **500 MHz**, **200 MHz**, **100 MHz**, **50 MHz**, **32 MHz**, **16 MHz**, **8 MHz** and **4 MHz** (This last one only in satellite band).

Reference level Defines the reference level between **10** and **130 dBµV** in **10 dB** steps.

Dynamic range Defines a selectable dynamic range between **2**, **5** and **10 dB/div**.

Dual marker (Only analogue channels, level measurement mode and *single marker* mode). Enables dual markers to be shown on the displayed spectrum.

Marker B➔A (Only in *dual marker* mode). Selects marker **A** as the active marker (tuneable).

Marker A➔B (Only in *dual marker* mode). Selects marker **B** as the active marker (tuneable).

Single marker (Only in *dual marker* mode). Activates the single marker on the displayed spectrum.

Carrier➔Ref. Noise (Only in *C/N* measurements). Permits to define the frequency where noise level will be measured (*see Ref. Noise ➔Carrier* function).

Ref. Noise ➔Carrier (Only when measuring *C/N Referenced* and after defining the *Carrier ➔ Ref. Noise*). Permits to change the tuning frequency by means of the rotary selector.

Marker➔Channel BW (Only in *Channel Power* measurements). Permits to define channel bandwidth (see *Channel BW ➔Marker* function).

Channel BW ➔ Marker (Only when measuring *Channel power* and after defining the *Marker ➔ Channel BW*). Permits to change the tuning frequency by means of the rotary selector.

Sweep Offers a choice of spectrum mode sweep rates: **Fast** (fast sweep, low accuracy), **High Resolution** (slow sweep, high accuracy) and **Antenna Alignment** (tool for faster sweep antenna alignment without numeric data representation).

Measure bandwidth Selects the bandwidth of the spectrum measuring filter from among:

Terrestrial channels: **50 kHz**, **230 kHz** or **1 MHz**.
Satellite channels: **50 kHz**, **230 kHz** or **4 MHz**.

Acquisition mode	Offers three acquisition modes: *Maximum Hold*, *Minimum Hold* and *Continuous* (default).
Detection mode	Offers two detection modes: *Average* and *Peak* (default).
DiSEqC	(Only satellite channels). Defines a sequence of DiSEqC commands and permits to send them.
System & Standard	Selects the colour system (**PAL**, **SECAM** or **NTSC**) and the TV standard (**B/G**, **D/K**, **I**, **L**, **M**, **N** or **Digital**).
Battery & Lnb	Displays battery voltage and external units power supply voltage and current (**V Ext** and **I Ext**).
Channel set	Selects active channels table.
Print	Prints the spectrum shown on the screen. (See '4.14 Printing the Spectrum, the Measurement and Memories').

Press **Next** for the second sub-menu, and from there to the third (you will see the same functions as those appearing in the second and third sub-menus in **TV mode**).

[5] **EXT VIDEO. Video signal presence light indicator**
It lights up when video on screen is coming through the SCART connector [39].

[6] **DRAIN**
External units power supply indicator. Lights up when the **PROLINK-4/4C *Premium*** supplies a current to the external unit.

[7] **CHARGER**
External DC charger operation indicator. When batteries are installed the battery charger is automatically activated.

[8] **BATTERY**
Battery charge level indicator. When the instrument is switched off and connected to the mains, the battery has three states: red if the battery charge level is below 50%, amber if it is greater than 50% and green if the battery is fully charged.

[9] **MONITOR**

[10] **MAIN KEYBOARD**
12 keys to select functions and entering numeric data.

English

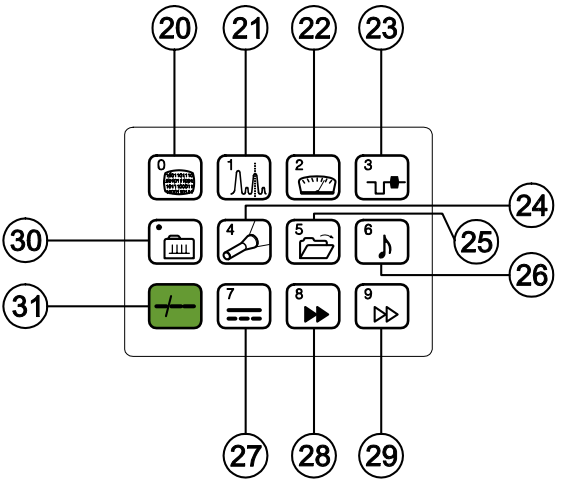

Figure 2.- Main keyboard

[20]

DIGITAL - ANALOGUE MODE SWITCHING

Switches between analogue and digital mode.
Key number 0 to enter numeric data.

[21]

SPECTRUM/TV MODE SWITCHING

Enables switching between the TV and the Spectrum Analyser operation mode, and back again.
Key number 1 to enter numeric data.

[22]

MEASURE

Enables the type of measurement to be selected. The types of measurements available depend on the band, the standard, the options included and the operating mode.
Key number 2 to enter numeric data.

[23]

TV MODE

Selects the information displayed on-screen in TV operation mode (LV measurement).
Key number 3 to enter numeric data.

[24] **SEARCH**

This is the function for automatic station search. Starting at the present frequency or channel, it searches until finds a station with an adequate level. The threshold level (search level) can be defined by means of the TV mode functions menu between 30 and 99 dBµV.
Key number 4 to enter numeric data.

[25] **STORE/RECALL**

This key enables the measurement configuration to be stored/recalled. Each configuration has the following information: name assigned to memory, memory number, Channel or frequency (**Freq**), TV system (**TV Sys**), measurement mode (**Meas**), external units power supply (**V Lnb**), measurement units (**Units**) and **Sound**. The memory can store up to 99 measurement configurations (numbered from 1 to 99).
Key number 5 to enter numeric data.

[26] **SOUND**

This selects the type of sound. The options available in each case depend on the band and the standard selected (see section *4.11 Selecting the Sound Mode*).
Key number 6 to enter numeric data.

[27] **EXTERNAL UNITS POWER SUPPLY**

Enables selecting the power supply to the external units. Available voltages are: **External, 13 V, 15 V**, **18 V** and **24 V** for the terrestrial band and **External, 13 V, 15 V, 18 V, 13 V + 22 kHz, 15 V + 22 kHz** and **18 V + 22 kHz** for the satellite band.
Key number 7 to enter numeric data.

[28] **DIRECT ACCESS KEY**

Direct access key which can be assigned to any function on any menu.
Key number 8 to enter numeric data.

[29] **DIRECT ACCESS KEY**

Direct access key which can be assigned to any function on any menu.
Key number 9 to enter numeric data.

English

[30] **TUNING BY CHANNEL OR FREQUENCY**

Switches tuning mode between channel and frequency. In channel mode the tuning frequency is defined by the active channels table (CCIR, OIRT, ...). See channel-frequency tables in Appendix A.
Decimal point key to enter numeric data.

[31] **MANUAL FREQUENCY SELECTION / SHIFT**

Enables the desired frequency to be directly tuned using the numeric keyboard. Also acts as a SHIFT key for moving across different fields on some screens.

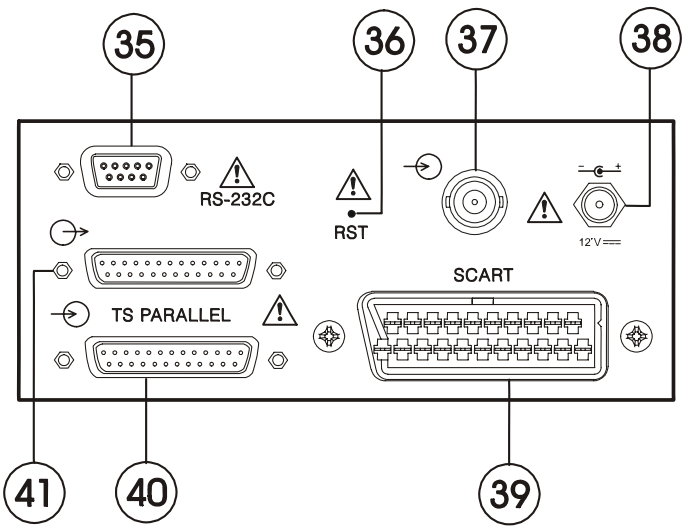

Figure 3.- Side panel connections.

[35] **Connector RS-232C**

Enables the remote control of the **PROLINK-4/4C *Premium*** from a personal computer, as well as data dumping to a printer.

[36] **RESET button**

Enables the user to restart the instrument if there is any irregularity in its functioning. If it is necessary to reset the instrument, press the reset button with the instrument turned off.

[37] **RF RF signal input.**
Maximum level 130 dBµV. Universal connector for F/F or F/BNC adapter, with input impedance of 75 Ω.

ATTENTION

Note the importance to protect the RF [37] input signal with an accessory to block the AC voltages used in CATV cables (needed to feed the amplifiers) and remote mode.

[38] **External 12 V power supply input**

[39] **Scart socket**

[40] **Parallel Input Connector (LVDS D-25)**
Direct input of MPEG-2 / DVB Transport Stream signals.

[41] **Parallel Output Connector (LVDS D-25)**
Output consisting of MPEG-2 / DVB Transport Stream signals corresponding to the RF signal reaching the instrument.

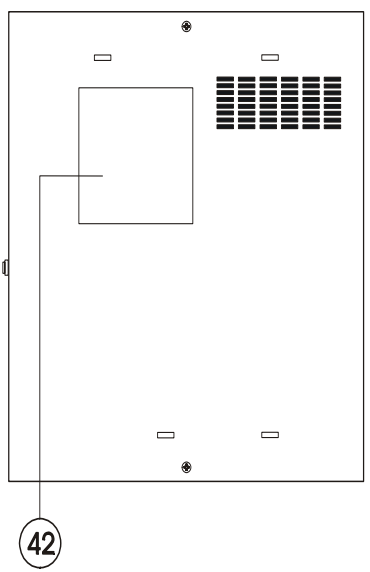

Figure 4.- Connector for CAM modules, external view.

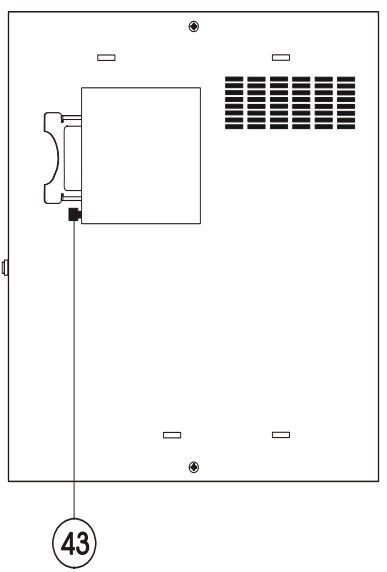

Figure 5.- Button for extracting CAM modules.

[42] **Connector for CAM module**
Enables the conditional access (disencryption) of encoded digital TV signals.

[43] **Button for activating the CAM module extractor mechanism**
It allows the expulsion of **CAM** module inserted into the connection socket.

4.2 Adjustment of Volume and Monitor Parameters

Repeatedly pressing key [3] sequentially activates the **VOLUME**, **CONTRAST, BRIGHTNESS** for models **PROLINK-4/4C *Premium*** and the **SATURATION** and **HUE** (for **PROLINK-4C *Premium*** and this last only for NTSC colour system) control menus. On activation of a menu for a specific parameter the screen displays a horizontal bar whose length is proportional to the parameter level, to modify this value simply turn the rotary selector [4]. To exit the menu and validate the new value press the rotary selector [4].

4.3 Selecting the Operation Mode: TV / Spectrum Analyser

The **PROLINK-4/4C *Premium*** has two basic operation modes: **TV** and **Spectrum Analyser**. To switch from one operation mode to the other press key [21].

In the **TV operation** mode the demodulated television signal is shown on-screen; this is the default operation mode, various functions can be selected, as shown in the following paragraphs.

In the **Spectrum Analyser** operation mode the screen displays the spectrum of the active band (terrestrial or satellite). The *span*, the *reference level* and the *measuring filter bandwidth* are variable as will be shown in paragraph '*4.10 Spectrum Analyser Operation Mode'*.

4.4 RF Band Selection: 5-862 MHz / 900-2150 MHz

Tuning is continuous between 5 and 862 MHz (terrestrial band) and between 900 and 2150 MHz (satellite band). There are three ways of changing the active band:

1) Press the rotary selector [4] to accede to the functions menu, if necessary turn it to select the **Band switching** function and then press it again. The RF band will be switched automatically.

2) Press key [31] and select a frequency on the new band using the numeric keyboard. The fifth digit and second decimal act as confirmation. For example, if the active band is the 900 to 2150 MHz band and you wish to tune the 49 MHz frequency (belonging to the 5/45 to 862 MHz band), press key [31] and then enter **49.00** or **049.0** using the numeric keyboard.

Alternatively, the rotary selector [4] can be pressed to indicate the end of the numerical entry.

3) Recall a memory with a tuning frequency belonging to the band you wish to access. (See section '*4.12 Measurement Configuration Memories*').

4.5 Channel Tuning / Frequency Tuning

Pressing key [30] the **PROLINK-4/4C *Premium*** switches from frequency tuning to channel tuning and back again.

In **channel tuning mode** turning the rotary selector [4] sequentially tunes the channels defined in the active channels table (see the **Channel set** function in the TV mode functions menu, section '*4.9.4.7 Selecting the Channels Table*'). When turning it clockwise frequency increases while turning it anticlockwise frequency decreases.

In **frequency tuning mode** there are two ways of tuning:

1. **Turning the rotary selector** [4].
   Turning the rotary selector [4] selects the desired frequency (tuning is continuous from 5 to 862 MHz and from 900 to 2150 MHz). When turning it clockwise frequency increases while turning it anticlockwise frequency decreases.

2. **Using the keyboard**.
   Press key [31] (the frequency listing will disappear), next enter the frequency value in MHz using the numeric keyboard, the fifth digit, to press the rotary selector [4] or the second decimal that acts as confirmation. The **PROLINK-4/4C *Premium*** will calculate the tuneable frequency closest to the entered value and then display it on-screen.

4.6 Automatic Transmission Search

In the TV mode, by pressing the [24] key search starts at the present frequency or channel until it finds a transmission with a level higher than the search level. The threshold level is defined by means of the ***Search level*** function of the TV mode functions menu (see paragraph '*4.9.4.16 Search Level*'.).

The **Search** function halts the search process when the end of the present band is reached, if it is in frequency mode, or when a key is pressed. In channel mode, the search process is halted when the last channel of the group selected is reached (see Appendix A). The sound is deactivated during the search process.

English

4.7 Selecting Analogue / Digital Mode

Measuring the characteristics of a channel depends, in the first place, on the type of modulation: analogue or digital.

Use key [20] to switch between analogue and digital channels. When switching to a new modulation, the **PROLINK-4/4C *Premium*** activates the last measurement configuration used for that modulation.

Also it is possible to switch between analogue and digital modes by means of **System & Standard** from function menu.

4.8 External Units Power Supply (EXT. SUPPLY)

The **PROLINK-4/4C *Premium*** can supply the voltage needed to power the external units (antenna preamplifiers, in the case of terrestrial TV, LNB in the case of satellite TV, or IF simulators).

Maximum input levels

DC to 100 Hz **50 V rms (powered by the AL-103 power charger)**
30 V rms (not powered by the AL-103 power charger)

5 MHz to 2150 MHz **130 dBµV**

To select the supply voltage of the external units, press key [27], and the screen will display a functions menu labelled **EXT. SUPPLY** listing the choice of voltages (which will depend on the band being used). Turn the rotary selector [4] to the desired voltage and press to activate it.

The following table shows the choice of supply voltages:

Band	Powering voltages
SATELLITE	External 13 V 15 V 18 V 13 V + 22 kHz 15 V + 22 kHz 18 V + 22 kHz
TERRESTRIAL MATV	External 13 V 15 V 18 V 24 V

Table 1.- External units powering voltages.

In the **External** power supply mode the unit powering the amplifiers before the antenna (terrestrial television) or the satellite TV receiver (house-hold or community) also powers the external units.

The **DRAIN** [6] indicator lights when current is flowing to the external unit. If any kind of problem occurs (e.g., a short circuit), an error message appears on the monitor ('SUPPLY SHORT'), the acoustic indicator will be heard and the instrument will cease to supply power. The **PROLINK-4/4C *Premium*** does not return to its normal operating state until the problem has been solved.

4.9 TV Operating Mode

4.9.1 Selecting the Measurement Mode (MEASURE)

The types of measurements available depend on the band, the standard and the operating mode.

Terrestrial band - Analogue channels:

Level — Level measurement of the currently tuned carrier.

Video / Audio — Video carrier to audio carrier ratio.

C / N — Ratio between the modulated signal power and the equivalent noise power for a same bandwidth. There are two methods to make this measurement (selectable through the **C/N setup** function):
Auto: In-channel measurement. Noise level is measured at a frequency where modulation contents is minimum. After a small period of time, minimum measured level corresponds to noise level.
The equivalent noise power measurement is carried out by means of a patented procedure of statistical stimation.
Referenced: The user defines the frequency where noise level will be measured (by means of the **Reference noise** function). This frequency will be used to measure noise level for all channels.

Terrestrial band - Digital channels:

Channel power — *Automatic method*: channel power is measured assuming that power spectral density is uniform throughout channel bandwidth. To measure it correctly it is indispensable to define the **Channel BW**.

C/N — Two methods selectable through the **C/N setup** function:
Auto: Out-channel measurement. Noise level is measured at $f_{noise} = f_{tuning} - ½ * Channel\ BW$. To measure it correctly digital channel must be tuned at its central frequency.

English

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176
FAX 781.665.0780 - TestEquipmentDepot.com

Referenced: The user defines the frequency where noise level will be measured (by means of the **Reference noise** function). This frequency will be used to measure noise level for all channels.

DVB-C Obtains the error rate for the signal found in the tuned channel. After processing for a few seconds, the screen on the **PROLINK-4/4C** ***Premium*** shows the type of modulation, the **MER** (modulation error ratio), and the **BER** (error rate) for the digital signal before error correction (**BER before FEC**), the latter two are shown in analogue form as a bar graph. The instrument also shows the channel or frequency with the corresponding deviation, the number of wrong packets received during the measurement time (**W.P.**) and information on the type of digital ***Multiplex*** detected (MPEG2, Network, Provider, Bouquet) which appears cyclically on the screen.

DVB-T Obtains the error rate for the signal found in the tuned channel. After processing for a few seconds, the screen on the **PROLINK-4/4C** ***Premium*** shows the type of modulation, the **CSI** (*Channel Status Information*) or the **MER** measurement (modulation error ratio) selectable by means of the option **COFDM Setup** from functions menu, as well as the **BER** (error rate) for the digital signal after error correction (**BER after Viterbi**), the latter two are shown in analogue form as a bar graph. The instrument also shows the channel or frequency with the corresponding deviation, the number of wrong packets received during the measurement time (**W.P.**) and information on the type of digital ***Multiplex*** detected (MPEG2, Network, Provider, Bouquet) which appears cyclically on the screen.

DAB The **DAB** signals analyse functions, allow to measure the **SNR** (*Signal to Noise Ratio*) and the **CBER** (*Coded BER*) as well as the number of signal losses and the information corresponding to the **Multiplex** detected.

Satellite band - Analogue channels

Level Level measurement of the currently tuned carrier.

C/N Ratio between the modulated signal power and the equivalent noise power for a same bandwidth. (**Auto** or **Referenced**)

Satellite band - Digital channels

Channel power *Automatic method*.

C/N Ratio between the modulated signal power and the equivalent noise power for a same bandwidth. (**Auto** or **Referenced**)

DVB-S Obtains the error rate for the signal found in the tuned channel. After processing for a few seconds, the screen on the **PROLINK-4/4C** ***Premium*** shows the type of modulation, the **BER** (error rate) for the digital signal before error correction (**BER before FEC**) or the **MER** measurement (Modulation Error Ratio) selectable by means of the option **QPSK Setup** from functions menu, as well as the **BER** (error rate) for the digital after error correction (**BER after Viterbi**), the latter two are shown in analogue form as a bar graph. The instrument also shows the channel or frequency with the corresponding deviation and information on the type of digital ***Multiplex*** detected (MPEG2, Network, Provider, Bouquet) which appears cyclically on the screen.

To change the measurement mode press key [22]. The screen will display a menu with the measurement modes which can be selected.

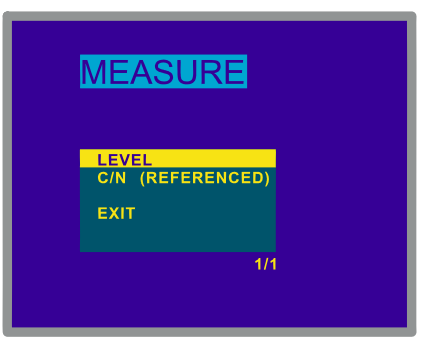

Figure 6.- Measuring mode selection (satellite band, analogue channels).

To select a measurement mode turn the rotary selector [4] until it is marked (e.g., *Level* in the previous figure), then press the rotary selector [4] or key [22] to activate the selected measurement mode.

4.9.1.1 Measuring the Video Carrier Level *(Level)*

If you select the **Level** measurement mode, the screen shows a window with the signal level, when selected with the OSD key [2] (see next section).

WARNING

If a sudden signal level increase is produced at the RF input, and it is beyond the total signal levels of:

Terrestrial band: ***95 dBµV***
Satellite band: ***105 dBµV***

the tuning circuit may become out of control, giving as a result wrong level measurements.

If this situation occurs, disconnect the input signal, change to Spectrum Analyser mode and select a Reference Level of 130 dBµV. Then connect the signal again and modify the Reference Level according to present signals.

Similar effects can be observed when at the RF input appears an important number of carriers with a high level. To be able to determinate the equivalent level of a carrier group (with similar levels) at the RF input, it is possible to use the expression:

$$L_t = L + 10 \log N$$

L_t: equivalent total level
L: average level of the carriers group
N: number of carriers

So, if there are ten carriers with a level around 90 dBµV, their equivalent level will be:

$$90\ dB\mu V + 10 \log 10 = 100\ dB\mu V$$

Observe that in this case, loss of tuning by overload of the RF input may occur besides other effects such as tuner saturation and generation of intermodulation products that may mask the spectrum visualization.

4.9.1.1.1 Changing the measurement information format

In **TV operation mode**, the measurement information format to be displayed on-screen is selected by pressing key [2]. Three possibilities are offered, selected cyclically:

- TV image with a window in the lower part of the screen displaying the signal level and frequency/channel.
- TV image with a window displaying information on the name assigned to memory, power supply to external units, sound, colour system, TV standard, level and frequency/channel.
- TV image only.

In the case of tuning a FM transmitter that emits RDS service, when pressing the key [2] will update the data represented on the screen.

In **digital channels**, pressing [2] shows the corresponding TV image for the tuned digital signal. You will need to have previously correctly configured the tuning process for the digital signal. (See *'4.9.1.5 BER Measurement Mode Selection'*.) The time employed in decoding very much depends on the structure and quantity of data tables within the **TS** and the condition of your instrument, but is generally less than 20 seconds. It is also possible to select if you want to appear on the monitor information about digital measurements. Three choices are offered, and may be selected cyclically:

- TV image, with a window appearing at the bottom showing the readings associated with the signal and the information given by the tuned digital service (*Network*, *Provider*, *Bouquet*).
- TV image only.
- Screen showing the digital parameters read by the instrument.

In all these cases, the TV image can only be visualised if it is not encrypted (FTA), or if a suitable CAM module and the corresponding valid subscriber card are available.

When a DAB channel is decoded, the key [2] allows to obtain on the screen all data associated to the tuned audio.

4.9.1.1.2 Selecting TV Mode: TV, LV, SY (TV MODE)

In addition to operating as a television set, the monitor of the **PROLINK-4/4C *Premium*** can act as an analogue level indicator, and can display the line synchronising pulse just as it would appear on a screen of an oscilloscope.

To change the TV mode press key [23], and the following screen will appear:

English

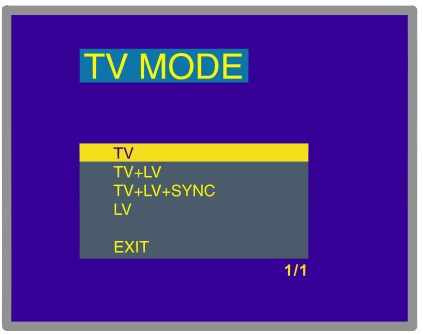

Figure 7.- TV mode selection.

Turn the rotary selector [4] to choose the information you want to be displayed on-screen. Press the rotary selector [4] or key 3 [23] to activate the selected display mode.

The operation modes available are:

TV: Monitor operating as a conventional **television set**.

TV+LV: Monitor operating as a conventional **television set**, with a **level indicator** on the upper part of the screen (the analogue bar).

TV+LV+SY: Monitor operating as a conventional **television set**, with a **level indicator** and the **line synchronizing pulse** displayed on the screen.

LV: Signal **level indication** on the upper part of the screen (analogue bar).

Operation in TV+LV+SY Mode

This function permits to display the line synchronising pulse corresponding to a tuned signal on the monitor.

To view the synchronisation pulse press key 3 [23], turn the rotary selector [4] to **TV + LV + SY** mode, and then press key 3 [23] or the rotary selector [4] again.

The monitor is divided into three sections. In the top section an analogue bar appears which indicates the level of the signal received (59 dBµV in figure 8 example). On the left side the line synchronising pulse is represented as it would appear on the screen of an oscilloscope. On the lower side the TV picture is shown.

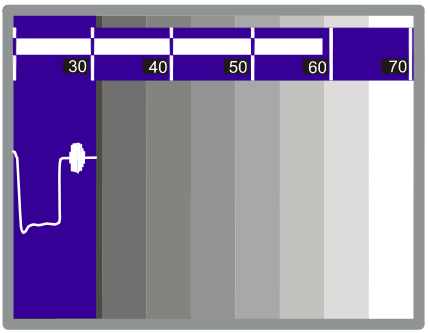

Figure 8.- Line synchoronism + level + TV (TV+LV+SYNC)

Starting from the line synchronism representation, it is possible to perform a qualitative analysis of the TV picture delivered to the end user.

4.9.1.2 Measuring the Video / Audio Ratio (V/A)

In the **Video/Audio** measurement mode, the screen displays the following information:

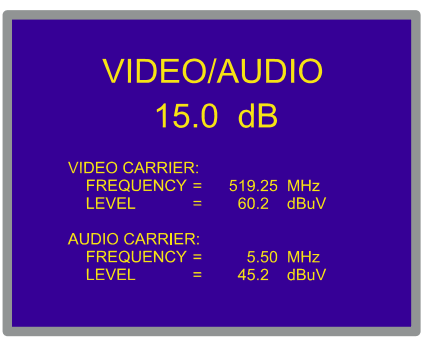

Figure 9.- Video/Audio rate measurement

In addition to the video carrier / audio carrier level ratio (15.0 dB in previous figure) this also shows the frequency or channel, depending on the tuning mode selected, and the level of the video carrier and audio carrier.

4.9.1.3 Measuring the Carrier / Noise Ratio (C/N)

The **PROLINK-4/4C *Premium*** offers two ways to make this measurement:

English

Auto: The **PROLINK-4/4C *Premium*** defines the frequency where noise level is measured automatically.

Reference noise: The user defines the frequency where noise level is measured (by means of the **Reference noise** function). This frequency will be used to measure noise level for all channels.

To select the measuring method activate the TV mode functions menu by pressing the rotary selector [4], then turn it to select **C/N setup** function and finally press it again. The monitor will show a screen displaying two possibilities: **C/N (Auto)** and **C/N (Reference noise)**, then turn the rotary selector to select the desired option and finally press it to confirm.

When selecting the **C/N (Reference noise)** mode it is necessary to define the noise frequency: access the functions menu and now turn the rotary selector to select **Reference noise** function and finally press it again. A screen titled REFERENCE NOISE will be displayed showing the noise frequency in use. To change it press key -/-- [31], the current frequency value will disappear and, using the keyboard, you will be able to enter the new reference noise frequency in MHz and with two decimals figures. This frequency also can be modified in the Spectrum operation mode (see *4.10.2.2. C/N (Referenced) Measurement*).

The **PROLINK-4/4C *Premium*** carries out C/N ratio measurement in four different ways, according to the carrier type and the band in use:

A) Terrestrial band, analogue carrier
Carrier level is measured using a quasi-peak detector (230 kHz BW). Noise level is measured with an average detector and corrected to refer it to channel equivalent noise bandwidth (according to the definition of the selected standard).

B) Terrestrial band, digital carrier
Both measurements are done with an average detector (230 kHz) and the same corrections are introduced on them (bandwidth corrections).

C) Satellite band, analogue carrier
Carrier level is measured using a quasi-peak detector (4 MHz BW). Noise level is measured with an average detector (4 MHz) and corrected to refer it to channel bandwidth.

D) Satellite band, digital carrier
Equivalent to case B but now using the 4 MHz BW filter.

On selecting the **Carrier / Noise** measurement mode the screen displays the following information:

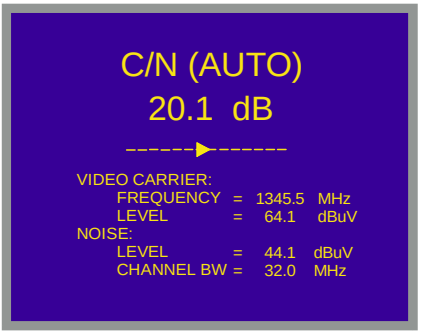

Figure 10.- Carrier-to-noise ratio measurement (Auto mode).

As well as the video carrier / noise level ratio (20.1 dB in previous figure), the frequency or channel (depending on the tuning mode selected) and the *level* of the *video carrier* and *noise level* are also shown.

When measuring channels in the satellite band or digital channels, to measure the C/N ratio correctly, the bandwidth of the channel must be defined previously, using the ***Channel BW*** function on the TV mode functions menu.

IMPORTANT REMARK

*To measure digital channels C/N ratio in **Auto** mode it is indispensable to tune channel at its central frequency.*
*In the case of the presence of adjacent digital channels, these could mask the noise level measurement when operating in **Auto** mode. Therefore, you are recommended to use the **Referenced** mode.*

IMPORTANT REMARK

*In the case of an **analogue terrestrial** signal, when **C/N (Auto)** mode is selected, the **PROLINK-4/4C** **Premium** performs an in-channel measurement, this involves that C/N value will take several seconds to stabilize (six seconds at the most). An arrow below the C/N readout represents the measurement cycle and it is necessary to wait the arrow passes twice on the same point to guarantee a correct measurement.*

4.9.1.4 Measuring the Power of Digital Channels *(Channel power)*

The **PROLINK-4/4C** ***Premium*** offers two different methods to measure digital channels power, according to the active operation mode: *Automatic method* in **TV mode** and *Integration method* in **Spectrum mode**. The **Automatic method** measures digital channel power in the measurement filter bandwidth and estimates total channel power assuming that spectral density is uniform throughout channel bandwidth. On the other hand, the **Integration method** takes into account signal spectral distribution so

English

measurement is more accurate but slightly slower (see *4.10.2 Selecting the Measurements Mode*). The obtained measurements using these methods may differ some dBs, specially when the digital signal is degraded.

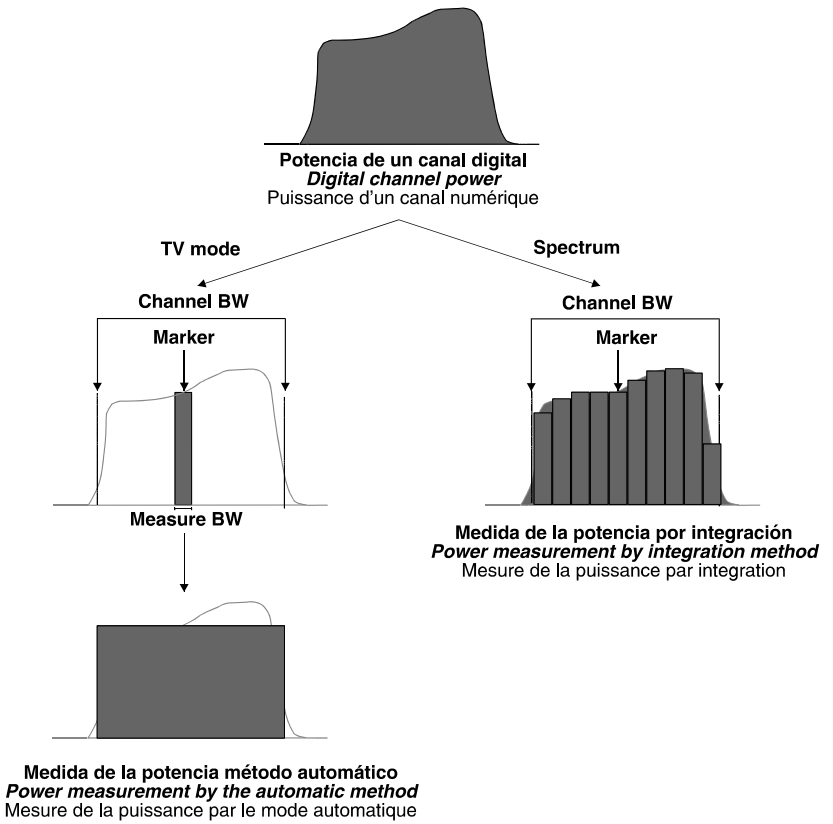

Figure 11.- Measuring digital power.

On selecting the **CHANNEL POWER** measurement mode, the screen displays the following information:

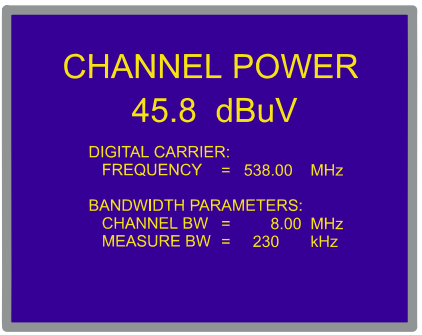

Figure 12.- Digital channel power measurement.

In addition to the power of the digital channel (45.8 dBµV in previous figure) this also shows the tuning frequency or channel, depending on the tuning mode selected, and the parameters regarding bandwidth: *Channel BW* and measuring filter bandwidth (*Measure BW*).

For the power measurement of a digital channel to be correct it is essential to have previously defined the channel bandwidth using the **Channel BW** function, in the TV mode functions menu (see section '*4.9.4.11 Channel Bandwidth*').

4.9.1.5 BER measurement mode selection

The **PROLINK-4/4C *Premium*** offers three ways to measure the error rate (**BER**) of digital signals depending on the type of used modulation.

To select the BER measurement mode:

1) Select the **TV** operating mode. If present operating mode is the spectrum analyser mode press key [21].

2) Select the terrestrial band for the measurement of QAM or COFDM modulated signals or the satellite band for the measurement of QPSK modulated signals. Available frequency ranges are:

DVB-C (QAM) signals	47 MHz to 862 MHz
DVB-T (COFDM) signals	40 MHz to 862 MHz
DVB-S (QPSK) signals	950 MHz to 2150 MHz

3) Select the **DIGITAL** operating mode by means of the key [20].

English

4) Select the **BER** measurement mode: to do this press key [22] and turn the rotary selector [4] to select the BER measuring mode, next, to activate it press the rotary selector [4] or key [22].

Before measuring the BER or analysing the *Wrong Packets* in the **Transport Stream** MPEG-2 / DVB is necessary to define some parameters concerning the digital signal, which are described in the following section (see section '*4.9.1.5.1. Measuring BER of QAM Digital Channels (QAM)*'). To see its present value or to modify it, being in the BER measuring screen, press the rotary selector, it will appear a multiple-choice menu showing the functions relative to the BER measurement on the screen.

Once set-up the necessary parameters for tuning and measuring the digital signals, depending on used modulation type, the **PROLINK-4/4C *Premium*** offers the possibility of visualizing the decoded digital TV images (see section '*4.9.3 Decoding MPEG-2 / DVB Channels, access to Digital Services*').

4.9.1.5.1 Measuring BER of QAM Digital Channels DVB-C (QAM)

Press the rotary selector to access the QAM signals parameters that must be defined by user and that are described below:

1) ***Modulations***
It defines the modulation type. When selecting this function and pressing the rotary selector a multiple-choice menu will appear on the screen, this menu permits to choose one of the following modulations: **16**, **32**, **64**, **128** and **256**.

2) ***Symbol Rate***
When selecting this function and pressing the rotary selector a multiple-choice menu will appear on the screen, this menu permits to choose one of the following values: **6900**, **6875**, **6111**, **5000**, **4443**, **1528**, **1500**, **1408**, **1333**, **1266**, **1000** kbauds, or well to define any other value by means of the ***Other*** option.

When selecting the ***Other*** option, a screen titled **QAM SYMBOL RATE** will appear, this screen shows present **Symbol Rate** value, to modify it press key [31], enter the new value (four figures) and finally press the rotary selector to activate it.

3) ***Spectral Inv.***
If necessary, activate the **Spectral inversion**. If the spectral inversion is not correctly selected, reception will not be correct.

4) ***Attenuator***
It permits to select attenuation between 0, 20 and 40 dB. It is advisable to activate the 40 dB attenuator under that measurement conditions where the signal level is near to the maximum input level (approximately starting from 20 dB under the maximum level) and it is possible that the tuner becomes saturated. Under no-saturation conditions, when increasing the attenuation value the BER measure

must to maintain or to increase (insufficient signal level) but never to decrease. In case of doubt, you must consider that the correct attenuator setting (0, 20 or 40 dB) will be that corresponds to the best BER measurement (value more low).

In case of doubt, you must consider that the correct attenuator setting (0 to 30 dB) will be that corresponds to the best BER measurement (value more low).

Once you have defined the QAM signal parameters, it will be possible to measure the BER.

When the **BER** measuring mode is selected, the monitor will show a picture like the following:

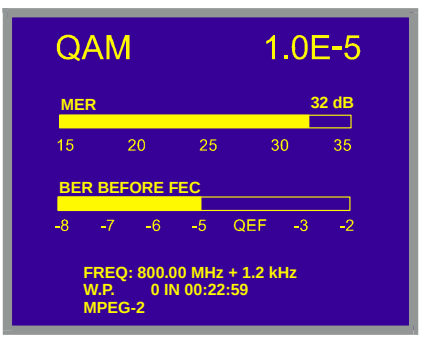

Figure 13.- BER measuring screen for QAM-modulated signals.

First of all, you will see the *modulation error ratio* measurement: ***MER***.

Analogue and digital carriers are very different in terms of signal contents and power distribution over the channel. They, therefore, need to be measured differently. The modulation error ratio (**MER**), used in digital systems is similar to the Signal/Noise (**S/N**) ratio in analogue systems. The **MER** represents the proportion of power lost through wrong data with respect to the mean power of an ideal **QAM** signal.

To operate, **QAM 64** demodulators require an **MER** greater than **23 dB**. Though it is preferable to have at least a **3** or **4 dB** margin to compensate for any possible degradation of the system. While **QAM 256** demodulators require an **MER** greater than **28 dB** with margins of al least **3 dB**. Normally, the maximum **MER** value seen in portable analysers is of approximately **34 dB**.

Secondly, it is shown the ***BER before FEC*** (Forward Error Correction).

In a digital reception system for cable signals, after the QAM demodulator an error correction method called **Reed-Solomon** is applied (see figure 14). Obviously, the error rate after the corrector is lower to the error rate at the QAM decoder output. This is the reason because this screen provides the BER measurement before FEC (Forward Error Correction) and the number of non-correctable errors (**W.P.**, *Wrong Packets*) received after Reed-Solomon in the measuring time.

English

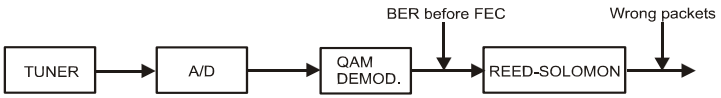

Figure 14.- Digital reception system via cable.

The BER measurement is provided in scientific notation (i.e. 1.0 E-5 means $1.0x10^{-5}$ that is to say one wrong bit of every 100,000) and through an analogue bar (as its length is smaller the signal quality will be better). The analogue representation is done on a logarithmic scale (not linear).

With the aim to have a reference about the signal quality, it is considered that a system has a good quality when it decodes less than one non-correctable error for every transmission hour. This border is known as **QEF** (**Quasi-Error-Free**) and it corresponds approximately to a BER before FEC of **2.0E-4 BER** ($2.0x10^{-4}$, that is to say two incorrect bits of every 10,000). This value is marked on the measurement bar of the BER and therefore, BER for acceptable signals must be at the **left** side of this mark.

Below the BER analogue bar it is shown the tuned frequency (or channel) and *the frequency deviation in kHz between the tuned frequency and the one which optimizes the BER* (i.e. *800.00 MHz + 1.2 kHz*).

This deviation must be adjusted, by means of tuning the channel again, to the more lower reachable value.

In the next line it is shown the number of non-correctable packets received '**wrong packets**' (up to a maximum of 126) in the time detailed on its right. A packet is considered wrong when one, at least, non-correctable bit is detected. To reset this measurement just modify the measurement conditions: for example change the tuned frequency.

Finally it is shown a status line which displays information about the detected signal. The possible messages that can appear and its meaning are shown in the following list. The messages are exposed from less to more fulfilment of the MPEG-2 standard:

No signal received
Any signal has been detected.

Signal received
A signal is detected but it can not be decoded.

Carrier recovered
A digital carrier has been detected but it can not be decoded.

MPEG-2
Correct detection of a MPEG-2 signal. The BER is showed.

In case of detecting a DVB signal, message **MPEG-2 DVB-C** will appear and the **DVB Channels Identifier** function will be automatically activated. (See section '*4.9.2 DVB Channels Identifier: DCI function*').

IMPORTANT REMARK

DVB-C channels tuning may require an adjusting process. It is recommended to follow next procedure:

1.- *From the **spectrum analyser** mode, tune the channel at its central frequency.*
2.- *Switch to **TV mode**, **BER** measuring mode.*
3.- *If in the lower line of the screen does not appear **MPEG-2** message (and consequently BER is unacceptable), by turning the rotary selector deviate the tuning frequency until **MPEG-2** message appears. Finally tune channel again to minimize the **frequency deviation which optimizes the BER** and therefore minimize the BER.*

If it is not possible to detect any MPEG-2 channel, make sure that digital signal parameters are correctly defined and if signal level is too low, check that the 40 dB attenuator is not activated (**Attenuator 0 dB**).

English

4.9.1.5.2 Measuring BER of COFDM Digital Channels DVB-T (COFDM)

Press the rotary selector to access the COFDM signals parameters that must be defined by user and that are described below:

1) ***Carriers***
It defines the number of modulation carriers between **2k** and **8k**. To modify its value, place the marker over the **Carriers** field by turning the rotary selector and then press it: a menu will appear on the screen. Turning the rotary selector select the desired value for the Carriers parameter and finally press it again to validate.

2) ***Guard interval***
The **Guard Interval** parameter corresponds to the dead time between symbols, its purpose is to permit a correct detection in multi-path situations. This parameter is defined according to the symbol length: **1/4**, **1/8**, **1/16**, **1/32**. To modify its value, by turning the rotary selector, place the marker over the **Guard Interval** field and then press it : a menu with the available values will appear. Turning the rotary selector select the desired value and finally press it to validate. If **Guard Interval** parameter is not known it is possible to assign the **Auto** option for its automatic detection.

3) ***Channel BW*** (channel bandwidth)
Enables the channel bandwidth to be selected between 8 MHz, 7 MHz and 6 MHz. The selection of this parameter is essential for the correct operation of the tuner, as it affects the frequency separation of the carriers.

4) ***Spectral Inv.*** (spectral inversion)
This option enables spectral inversion to be applied to the input signal, though in the majority of cases it should be in the OFF position (not inversion).

5) ***Attenuator***
It permits to select attenuation between 0, 20 and 40 dB. It is advisable to activate the 40 dB attenuator under that measurement conditions where the signal level is near to the maximum input level (approximately starting from 20 dB under the maximum level) and it is possible that the tuner becomes saturated. Under no-saturation conditions, when increasing the attenuation value the BER measure must to maintain or to increase (insufficient signal level) but never to decrease.

This configuration menu shows, besides the user definable COFDM signal parameters, the value of the rest of COFDM signal parameters detected automatically:

Code Rate Also known as Viterbi ratio, defines the ratio between the data bits number and the total number of bits transmitted (the difference corresponds to the number of control bits for the error detection and recovery).

Modulations Carriers modulation. It also defines the system noise immunity. (QPSK, 16-QAM and 64-QAM).

Hierarchy The DVB-T norm contemplates the possibility to make a TDT transmission with hierarchical levels, it is to say a simultaneous transmission of the same program with different image qualities and noise protection levels, in order the receiver can exchange to a signal of smaller quality when the reception conditions are not optimal.

Once you have defined the COFDM signal parameters, it will be possible to measure the **BER**. When the **BER** measuring mode is selected, the monitor will show a picture like the following:

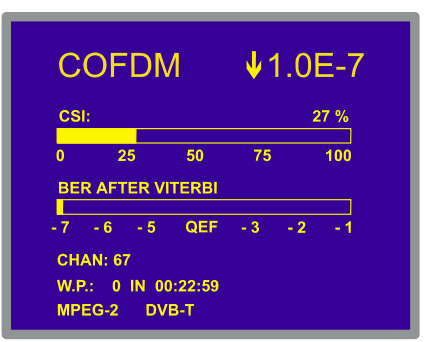

Figure 15.- BER measuring screen for COFDM-modulated signals

Two measures are shown :

1) ***CSI***: Channel status information
or ***MER***: Modulation error ratio or ***BER before FEC***

2) ***BER after Viterbi*** : BER measured after Viterbi

The **CSI** measure (*Channel Status Information*) is a qualitative measure about channel state, between 0 and 100%. The optimum value corresponds to 0%. This measure permits to look for the best situation even in those measuring conditions where the measured BER is best than the minimum readout (in this way, in the example of the previous figure, the measured BER is lower that the minimum readout, $1.0x10^{-7}$, but the CSI measurement, 27%, still can be improved).

Next it is shown the **BER after Viterbi** measurement both in numeric and graphic bar format.

In a reception system of terrestrial digital signal, after the COFDM decoder two error correction methods are applied. Obviously, each time we apply an error corrector to the digital signal, the error rate changes, therefore if we measure the error rate at the output of the COFDM demodulator, at the output of the Viterbi decoder, and at the output of the Reed-Solomon decoder, we obtain nothing more than different error rates. The **PROLINK-4/4C *Premium*** provides the ***BER after Viterbi*** and the number of ***Wrong packets*** received after Reed- Solomon.

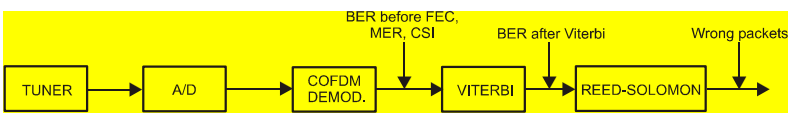

Figure 16.- COFDM reception system.

The BER measurement is provided in scientific notation (i.e. 3.1 E-7 means $3.1x10^{-7}$, that is to say 3.1 wrong bits of each 10000000) and through a graphic bar (as its length is smaller the signal quality will be better). The analogue representation is done on a logarithmic scale (not linear), that is to say, the bar divisions correspond to the exponent of the measurement.

With the aim to have a reference about the signal quality, it is considered that a system has a good quality when it decodes less than one non-correctable error for every transmission hour. This border is known as **QEF** (**Quasi-Error-Free**) and it corresponds approximately to a BER after Viterbi of **2.0E-4 BER** ($2.0x10^{-4}$, that is to say 2 wrong bits of each 10000). This value is marked on the measurement bar of the BER and therefore, BER for acceptable signals must be at the **left** side of this mark.

In the lower line of the screen it appears the **W. P.** counter (Wrong Packets counter). This counter shows the number of non-correctable packets received after Reed-Solomon during the measuring time. This counter is automatically activated when the unit detects an MPEG-2 signal.

English

If at any time, the received signal stops to satisfy the requirements of the MPEG-2 standard, this counter will deactivate, that is to say it will keep the number of non-correctable packets received and the measuring time, later, if an MPEG-2 signal is received again, it will activate with no reset.

When during any measuring time interval the counter has been deactivated, in other words the signal has not satisfied the MPEG-2 synchronism, the presentation of this counter will alternate with another counter. This second counter shows the time that the detected signal has not fulfilled the MPEG-2 standard requirements (12 seconds in the example of the following figure) and the number of signal cuts (2 in the example of the following figure). To reset the counter it is necessary to change any of the detection parameters, for example tune again the signal or push twice the [22] key.

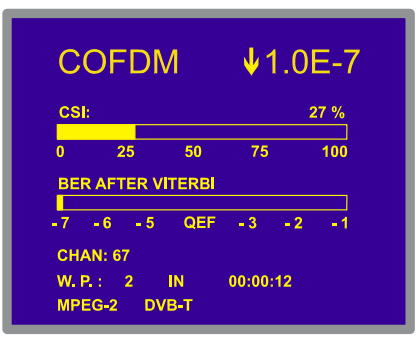

Figure 17.- Signalling two MPEG-2 signal cuts with a total length of 12 seconds.

Finally it is shown a status line with information about the detected signal. The possible messages that can appear and its meaning are showing the following list. The messages are exposed from less to more fulfilment of the MPEG-2 standard:

No signal received
No signal has been detected.

Timing recovered
Only it is possible to recuperate the symbol time.

AFC in lock
The system automatic frequency control can identify and lock a digital transmission (TDT) but its parameters can not be obtained. It can be due to a transitory situation previous to the TPS identification (*Transmission Parameter Signalling*) or well to a TDT transmission with an insufficient C/N ratio.

TPS in lock
The TPS (*Transmission Parameter Signalling*) are decoded. The TPS are carriers (17 in the 2k system and 68 in the 8k system) modulated in DBPSK, containing information related to the transmission, modulation and codification: Modulation type (QPSK, 16-QAM, 64-QAM), Hierarchy, Guard Interval, Viterbi Code Rate, Transmission mode (2k or 8k) and Number of the received frame.

MPEG-2
Correct detection of a MPEG-2 signal.

In case of detecting a DVB signal, message **MPEG-2 DVB-T** will appear and the **DVB Channels Identifier** function will be automatically activated. (See section *'4.9.2 DVB Channels Identifier: DCI function').*

The **PROLINK-4/4C *Premium***, also offers the possiblity of measuring the modulation error ratio (**MER**), **CSI** or **BER before FEC** simultaneously with the BER after Viterbi for COFDM signals. Once the COFDM signal parameters have been defined, you can access to the digital mode function menu by pressing the rotary selector [4], then turn it to select **COFDM setup** function from second submenu and finally press it again to activate it. The monitor will show a screen displaying three possibilities: **CSI**, **MER** and **BER before FEC**, then turn the rotary selector [4] to select the desired option and finally press it to confirm.

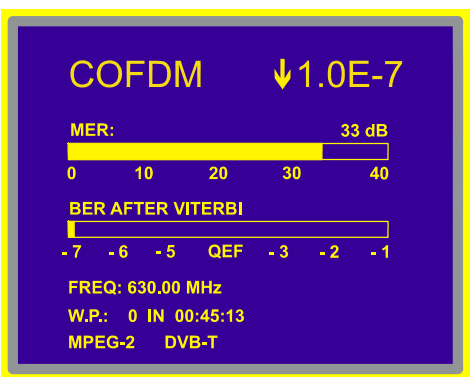

Figure 18.- MER measuring screen for COFDM-modulated signals.

English

IMPORTANT REMARK

DVB-T channels tuning may require an adjusting process. It is recommended to follow next procedure:

1.- *From the **spectrum analyser** mode, tune the channel at its central frequency.*
2.- *Switch to **TV mode**, **BER** measuring mode.*
3.- *If in the lower line of the screen does not appear **MPEG-2** message (and consequently BER is unacceptable), by turning the rotary selector deviate the tuning frequency until **MPEG-2** message appears. Finally tune channel again to minimize the **frequency deviation which optimizes the BER** and therefore minimize the BER.*

If it is not possible to detect any MPEG-2 channel, make sure that digital signal parameters are correctly defined and if signal level is too low, check that the 40 dB attenuator is not activated (**Attenuator 0 dB**).

4.9.1.5.3 Measuring BER of QPSK Digital Channels DVB-S (QPSK)

Press the rotary selector to access the QPSK signals parameters that must be defined by user and that are described below:

1) ***Symbol Rate***
It is possible to choose between the following values : **30000**, **27500**, **22000**, **20000**, **19995**, **6110**, **6000**, **5998**, **5632**, **5062**, **4340**, **4000** kbauds, or well to define any other value (***Other***).
When selecting the ***Other*** option, a screen titled **QPSK SYMBOL RATE** will appear. This screen shows present value, to modify it press key

and enter the new value through the keyboard. The unit accepts any number with **5 figures** between **2000 and 35000 kbauds** (fifth figure acts as validation). For example, to select a symbol rate of 8200 kbauds it must be entered : 08200.

2) ***Code Rate***
Also known as Viterbi ratio. It defines the ratio between the number of data bits and actual transmission bits (the difference corresponds to the control bits for error detection and correction).
It permits to choose between **1/2**, **2/3**, **3/4**, **5/6**, **7/8** and **Auto**. If **Code Rate** parameter is not known it is possible to assign the **Auto** option.

3) ***Spectral Inv.***
If necessary, activate the **Spectral inversion**. Reception will be bad if spectral inversion has been incorrectly selected.

4) ***Attenuator***
It permits to select attenuation between 0, 20 and 40 dB. It is advisable to activate the 40 dB attenuator under that measurement conditions where the signal level is near to the maximum input level (approximately starting from 20 dB under the maximum level) and it is possible that the tuner becomes saturated. Under no-saturation conditions, when increasing the attenuation value the BER measure must to maintain or to increase (insufficient signal level) but never to decrease.

Once you have defined the QPSK signal parameters, it will be possible to measure the BER. When the **BER** measuring mode is selected, the monitor will show a picture like the following:

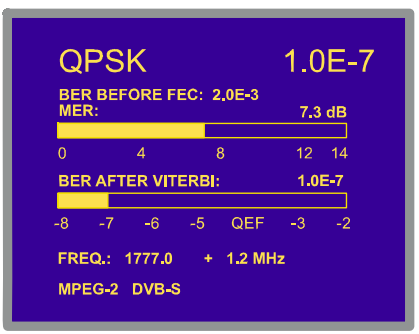

Figure 19.- BER measuring screen for QPSK modulated signals.

Two BER measurements are shown:

1) ***BER before FEC*** (Forward Error Corrections)

2) ***BER after Viterbi***

In a digital reception system for satellite signals, after the QPSK decoder two different correction methods are applied (see figure 20). Obviously, each time we apply an error corrector to a digital signal, the error rate changes, therefore if we measure in a digital satellite television system, for example, the error rate at the output of the QPSK demodulator, at the output of the Viterbi decoder, and at the output of the Reed-Solomon decoder, we obtain nothing more than different error rates. This is the reason because the BER measurement is provided before FEC, after Viterbi.

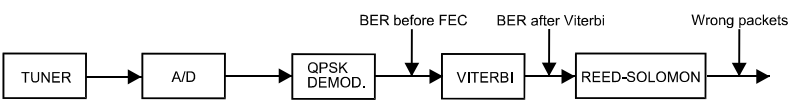

Figure 20.- Digital reception system via satellite.

English

The BER measurement is provided in scientific notation (i.e. 2.0 E-3 means $2.0x10^{-3}$, that is to say two incorrect bits of every 1,000) and through an analogue bar (as its length is smaller the signal quality will be better). The analogue representation is done on a logarithmic scale (not linear).

With the aim to have a reference about the signal quality, it is considered that a system has a good quality when it decodes less than one non-correctable error for every transmission hour. This border is known as **QEF** (**Quasi-Error-Free**) and it corresponds approximately to a BER after Viterbi of **2.0E-4 BER** ($2.0x10^{-4}$). This value is marked on the measurement bar of the BER after Viterbi and therefore, BER for acceptable signals must be at the **left** side of this mark.

Next it is shown the tuning frequency and the *frequency deviation in MHz between the tuned frequency and the one which optimizes the BER* (i.e. *Freq: 1777.0 + 1.2 MHz*).

Finally it is shown a status line with information about the detected signal. The possible messages that can appear and its meaning are shown in the following list. The messages are exposed from less to more fulfilment of the MPEG-2 standard:

No signal received
Any signal has been detected.

Signal received
A signal is detected but it can not be decoded.

Carrier recovered
A digital carrier has been detected but it can not be decoded.

Viterbi synchronized
A digital carrier has been detected and the Viterbi algorithm is synchronized, but too many frames arrive with non correctable errors. It is not possible to quantify the BER.

MPEG-2
Correct detection of a MPEG-2 signal.

In case of detecting a DVB signal, message **MPEG-2 DVB-S** will appear and the **DVB Channels Identifier** function will be automatically activated. (See section '*4.9.2 DVB Channels Identifier: DCI function*')**.**

IMPORTANT REMARK

DVB-S channels tuning may require an adjusting process. It is recommended to follow next procedure:

1.- *From the **spectrum analyser** mode, tune the channel at its central frequency.*
2.- *Switch to **TV mode**, **BER** measuring mode.*
3.- *If in the lower line of the screen does not appear **MPEG-2** message (and consequently BER is unacceptable), by turning the rotary selector deviate the tuning frequency until **MPEG-2** message appears. Finally tune channel again to minimize the **frequency deviation which optimizes the BER** and therefore minimize the BER.*

If it is not possible to detect any MPEG-2 channel, make sure that digital signal parameters are correctly defined and if signal level is too low, check that the 40dB attenuator is not activated (**Attenuator 0 dB**).

The **PROLINK-4/4C *Premium***, also offers the possiblity of measuring the modulation error ratio (**MER**) and **BER before FEC** for QPSK signals. Once the QPSK signal parameters have been defined, you can access to the digital mode function menu by pressing the rotary selector [4], then turn it to select **QPSK setup** and finally press it again to activate it. The monitor will show a screen displaying two measurement possibilities: **MER** and **BER before FEC** to represent it by means of a graphical bar, then turn the rotary selector [4] to select the desired option and finally press it to confirm.

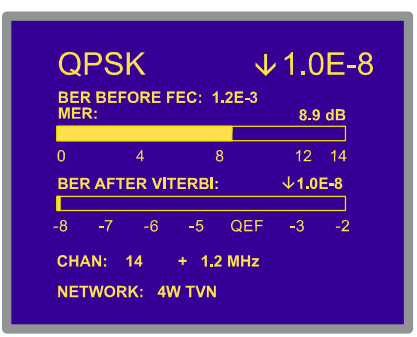

Figure 21.- MER measuring screen for QPSK-modulated signals.

4.9.1.5.4 Measuring Wrong Packets of TS MPEG-2 (W.P.)

When the **BER** measurement indicates acceptable reception quality (always to the left of the **QEF** level), and the identification information confirms that you have found the required channel, you can analyse the *Wrong Packets* received from the MPEG-2 / DVB *Transport Stream*.

English

Press the rotary selector [4] to access the functions menu in digital mode, and select the **Wrong Packets** option to access the **W.P.** measurement screen.

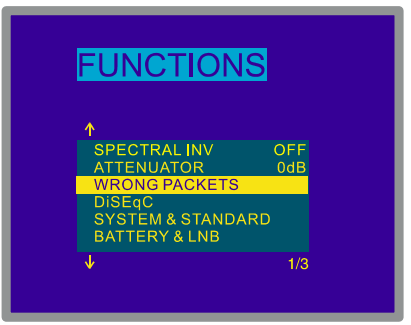

Figure 22.- Selecting the W.P. measurement function. (**WRONG PACKETS**).

To select the options on this screen press button -/-- [31] and/or the rotary selector [4].

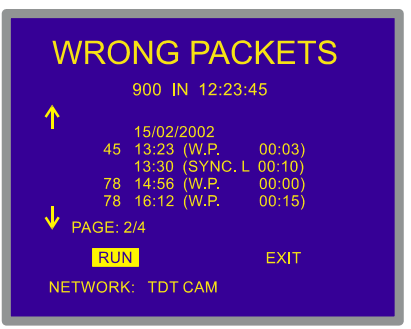

Figure 23.- W.P. measurement.

According to the information appearing on the screen in figure 22, the demodulator has detected 45 W.P. events, i.e. non-correctable packets, starting at 13:23 and for a time interval of 3 minutes.

On initiating an acquisition by pressing the rotary selector [4] over the **Run** option, then appears a message warning that the beginning of a new acquisition supposes the erasure of the data corresponding to the previous one. Press the key -/-- [31] and the rotary selector [4] to confirm the action, the instrument will record the events produced during reception of the MPEG-2 / DVB ***Transport Stream***, in accordance with the **TR 101 290** standard of the *Measurement guidelines for DVB systems* defined by the **ETSI** (*European Telecommunications Standards Institute*).

TEST	NAME	CHARACTERISTICS
1.1	**SINC. P (TS_sync_loss)**	Loss of synchronization with consideration of hysteresis parameters.
1.2	**SINC. B (Sync_byte_error)**	Sync_byte not equal 0x47.
1.3	**PAT (PAT_error)**	PID 0x0000 does not occur at least every 0.5 s. A PID 0x0000 does not contain a table_id 0x00 (i.e. a PAT) Scrambling_control_field is not 00 for PID 0x0000.
2.1	**TEI (Transport_error)**	Transport_error_indicator in the TS-Header is set to "1".

Table 2.- Description of W.P. available tests.

Once an acquisition has been initiated, the instrument automatically passes to **MANUAL POWER** mode to aid acquisition over the long term. To finish acquisition, press the rotary selector [4] over the **Stop** option, then appears a validation request message, to press the key -/-- [31] and the rotary selector [4] for finishing the running acquisition. The interruption of an acquisition supposes its definitive conclusion.

The first line on the screen shows the events that have been detected once at least from the acquisition beginning. Should any of the events on table 2 be produced, these will be displayed cyclically, indicating the number in case of being W.P. class, i.e. non-correctable packets. Turn the rotary selector [4] to access the list of events recorded in different pages.

To leave the screen once you have finished the acquisition, use key -/-- [31] to select **Exit** and press the rotary selector.

4.9.1.5.5 QAM Constellation Diagram

To select the QAM Constellation Diagram mode:

1) Select the **TV** operating mode. If present operating mode is the spectrum analyser mode press key [21].

2) Select the terrestrial band for the measurement of QAM modulated signals. Available frequency ranges are:

   QAM signals 47 MHz to 862 MHz

3) Select the **DIGITAL** operating mode by means of the key [20].

English

4) Select the **BER (QAM)** measurement mode: to do this press key [22] and turn the rotary selector [4] to select the BER (QAM) measuring mode, next, to activate it press the rotary selector [4] or key [22].

Before visualizing the representation of the Constellation Diagram is necessary to define some parameters concerning the digital signal (see section *'4.9.1.5.1 Measuring BER of QAM Digital Channels (QAM)'*).

5) Press the rotary selector [4] to access the functions menu in digital mode, and select the **Constellation** option to access the Constellation Diagram screen. Turn the rotary selector [4] to tune the **DVB-C (QAM)** digital signal to be graphically shown.

Observing QAM Constellation Diagrams.

In Constellation Diagram mode, the monitor will show a screen like the following one:

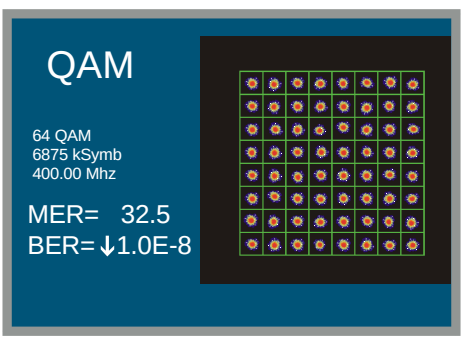

Figure 24.- Constellation Diagram of a **DVB-64 QAM** fair digital signal.

In the first line is shown the **Modulation Type**: **64 QAM**. Next indicate the **Symbol Rate**: **6875** and the frequency of tuning: **400 MHz**. Finally appear the values of **MER** and **BER** measurements.

This image corresponds to a correct digital signal. Nevertheless the visualization of the Constellation Diagram can discover the existence of different deteriorations from the **QAM** modulated digital signal, like the noise, phase error and the nonlinearities. All these can cause to a distortion or error in the location of the points on the Constellation Diagram. For example, the atmospheric noise can cause a simple location dispersion of these points as it is shown in figure 25. Also it can affect the transmission oscillator phase error, causing additional uncertainty in the constellation (figure 28).

In the following figures several Constellation Diagrams are shown as an example corresponding to differents common deteriorations in the digital transmission.

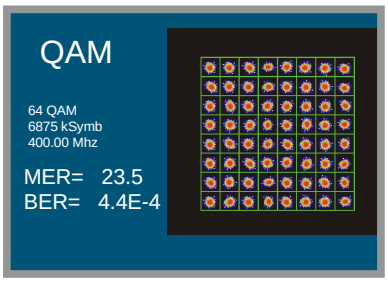

Figure 25.- Constellation Diagram of a signal with noise.

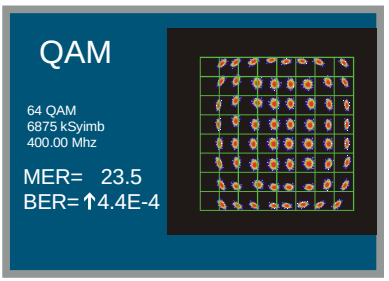

Figure 26.- Signal showing nonbalanced IQ levels.

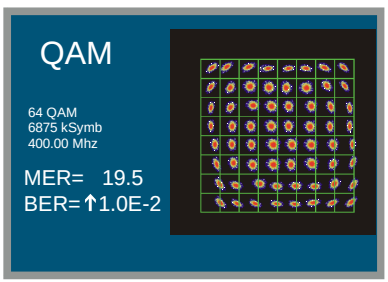

Figure 27.- Signal with noise and levels IQ nonbalanced.

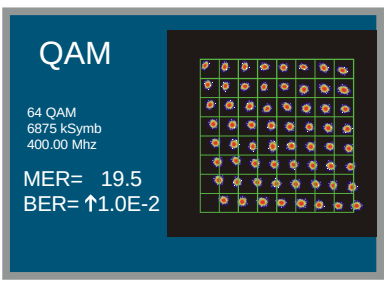

Figure 28.- Signal with phase error.

Such effects can induce to errors in the detection process and cause erroneous bits on recovered digital signal.

The **PROLINK-4/4C** ***Premium*** incorporates in addition, the **ZOOM** function to extend the presentation to only a quadrant between four available ones. Press the key repeatedly to change of quadrant and to switch on or off the zoom function. It allows so, a more detailed analysis of the observable effects and facilitates therefore the accurate diagnosis about causes or agents responsible for the digital signal deterioration (see figure 29).

REMARK: In the equipments with colour screen (**PROLINK-4C** ***Premium***) one visualizes qualitatively, by means of a colour gradation, the density of symbols that are concentrated in a certain area. This scale of colours goes from black (absence of symbols) to the red one (maximum density), runing through blue and yellow (in ascending order).

English

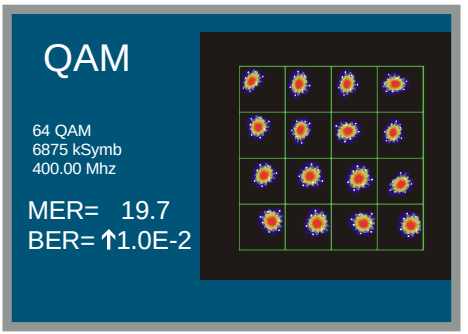

Figure 29.- QAM -Constellation Zoom function.

4.9.1.5.6 COFDM Constellation Diagram

To select the COFDM Constellation Diagram mode:

1) Select the **TV** operating mode. If present operating mode is the spectrum analyser mode press key [21].

2) Select the terrestrial band for the measurement of COFDM modulated signals. Available frequency ranges are:

COFDM signals	40 MHz to 862 MHz

3) Select the **DIGITAL** operating mode by means of the key [20].

4) Select the **BER (COFDM)** measurement mode: to do this press key [22] and turn the rotary selector [4] to select the BER (COFDM) measuring mode, next, to activate it press the rotary selector [4] or key [22].

Before visualizing the representation of the Constellation Diagram is necessary to define some parameters concerning the digital signal (see section *'4.9.1.5.2 Measuring BER of COFDM Digital Channels (COFDM)'*).

5) Press the rotary selector [4] to access the functions menu in digital mode, and select the **Constellation** option to access the Constellation Diagram screen. Turn the rotary selector [4] to select the carrier and by means of key [31] and turning the rotary selector [4] to tune the **DVB-T (COFDM)** digital signal to be graphically shown.

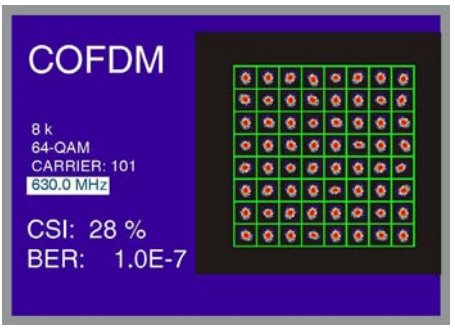

Figure 30.- Constellation Diagram of a **DVB-64 COFDM** fair digital signal.

The **PROLINK-4/4C** ***Premium*** incorporates in addition, the **ZOOM** function to extend the presentation to only a quadrant between four available ones. Press the key repeatedly to change of quadrant and to switch on or off the zoom function. It allows so, a more detailed analysis of the observable effects and facilitates therefore the accurate diagnosis about causes or agents responsible for the digital signal deterioration (see figure 31).

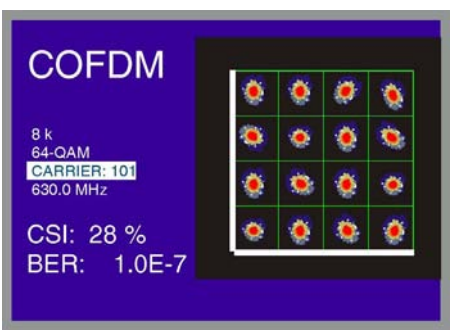

Figura 31.- QAM-Constellation Zoom function.

4.9.1.6 Digital audio broadcasting measurement (DAB)

The **PROLINK-4/4C** ***Premium*** incorporates the functionality of tuning, demodulating and decoding **DAB** terrestrial emissions (ETS 300 401):

To select the **DAB** measurement mode:

1) Select the **TV** operating mode and terrestrial band. If present operating mode is the spectrum analyser mode press key [21].

English

2) Select the **DIGITAL** operating mode by means of the key [20].

3) Select the **DAB** measurement mode: to do this press key [22] and turn the rotary selector [4] to select the **DAB** measuring mode, next to activate it, press the rotary selector [4] or key [22].

Once set-up the necessary parameters for tuning and measuring a **DAB** signal, the **PROLINK-4/4C *Premium*** after some seconds offers the possibility of monitoring the decoded digital radio sound.

REMARK: If it is not possible to detect any DAB channel, make sure that signal level is not too low, check that the 40 dB attenuator is not activated. (**Attenuator 0 dB**).

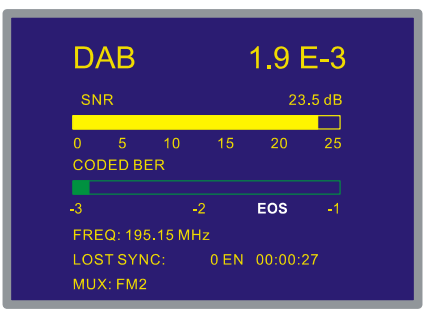

Figure 32.- DAB signal detection.

The measurement screen of **DAB** signal parameters shows:

SNR:

- ***Signal to Noise Ratio*** (dB). Measurement range from 0 dB to > 25.5dB.

CODED BER (CBER):
The error level of the received signal is indicated by means of the coded **BER** measurement in which the edge of service level is defined (**EOS**)[4] for each selected audio component. So, and as it is indicated on the instrument measurement screen, the reference values are:

[4] **REMARK**: EOS = 4.0E-2 Limit of subjective quality according to ETSI TR 101 758 recommendation

- < 1.0E-3: optimal reception.
- From 1.0E-3 to 3.0E-2: good reception.
- From 3.0E-2 to 6.0E-2: fair reception.
- From 6.0E-2 to 1.0E-2: poor reception.
- > 1.0E-1: bad reception.

The numerical value of this measurement also appears on the upper right corner of the screen.

LOST SYNC:
It states the number of times that is lost the detection of **DAB** signal in the specified time. This counter of synchronism losses is reinitiated whenever a new channel or a frequency is selected.

Figure 33.- List of available **DAB** audios.

Each **DAB** multiplex contains a number of services, and each service can contain a number of components. The **PROLINK -4/4C *Premium*** equipment shows a list of all the components (audio or data) available in the multiplex. A screen with additional information appears when pressing the [2] key showing the multiplex, service and its first component information. Also the rotary selector can be pressed [4] to accede to the functions menu in TV mode and then for obtaining the whole list of available **DAB** audio for that digital channel (**DAB audio list**).

English

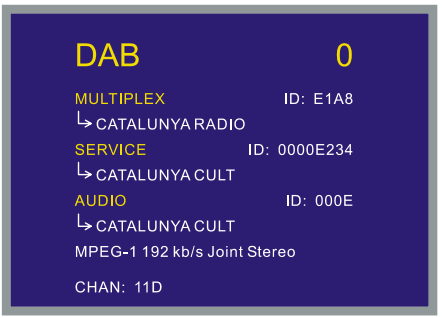

Figure 34.- Additional information about the available audio list.

Data showed are:

MULTIPLEX: Multiplex name and its identifier.
SERVICE: Service name and its identifier.
AUDIO: Includes information about identification, codification standard, bit rate and audio mode detected.

- Standard:
  - MPEG-1 Layer II: ISO/IEC 11172-3.
  - MPEG-2 Layer II: ISO/IEC 13818-3.
- Audio mode:
  - Mono
  - Dual channel
  - Joint Stereo
  - Stereo
- Bit rate:

  In case of MPEG-1codification:

  - 32, 48, 56, 64, 80, 96, 112, 128, 160, 192 kbit/s, in case of audio mono.
  - 64, 96, 112, 128, 160, 192, 224, 256, 320, 384 kbit/s in case of audio stereo, joint stereo and dual channel.

  In case of MPEG-2 codification:

  - 8, 16, 24, 32, 40, 48, 56, 64, 80, 96, 112, 128, 144, 160 kbit/s for all modes.

It appears, in case the provider emits it, a line with dynamic information (DLS) in the lower part of the screen.

Equally, the user will be able to select the component of audio to decode, directly identifying it by its name, by means of the rotary selector [4] turning.

4.9.2 DVB Channels Identifier: DCI[5] function

This function permits to identify **DVB** channels. It provides information of channel on which the **BER** measurement is made, as well as access to each one of the services contained in the resultant **Multiplex** of channel demodulation.

The **DVB** group recommends to digital TV service operators the transmission on the ***Transport Stream*** of some particular tables containing data information. The ***Transport Stream*** is a sequence of packets, of constant length, which carry video, audio, and data information.

Data packets can be grouped to constitute TABLES, some of these tables content information defined by the network operator and which show the type of service that is being supplied to the users. Among the different data defined in these tables, the most frequently used data for channel identification purposes are:

Network: It contents the name given to the set of all the ***Transport Stream*** managed jointly inside of a network formed by several physical communication channels. In case of satellite television, also contains the satellite orbital position pointed by the parabolic dish. This information is extracted from **NIT** (***Network Information Table***).

Service: It contents the names of video, audio or data services present in the **Transport Stream**. This information is extracted from **SDT** (***Service Description Table***).

Bouquet: It contents the name given to the set of all the services commercialized as one entity. The information, that in this case **DVB** defines as optional, is extracted from **BAT** (***Bouquet Association Table***) or from **SDT**.

Provider: It contents the provider name, which offer certain services. Within a **Multiplex** one, each one of services can have its own provider, but normally all services have a same provider. This information is extracted analyzing the **SDT**.

In case the operator includes this information, the three fields are not transmitted at the same time but they appear alternatively in different packets. Besides, the cadence of presentation of each one of these packets may vary from one operator to another.

[5] DCI, Device and Procedure patented by PROMAX ELECTRONICA, S.A. (Patent 9901632)

English

When tuning a **DVB** compatible transponder, the **DCI**[4] function (**DVB Channels Identifier**) detects those data packets including service information relative to these three fields and shows on the lower line on the screen the information contained in them automatically.

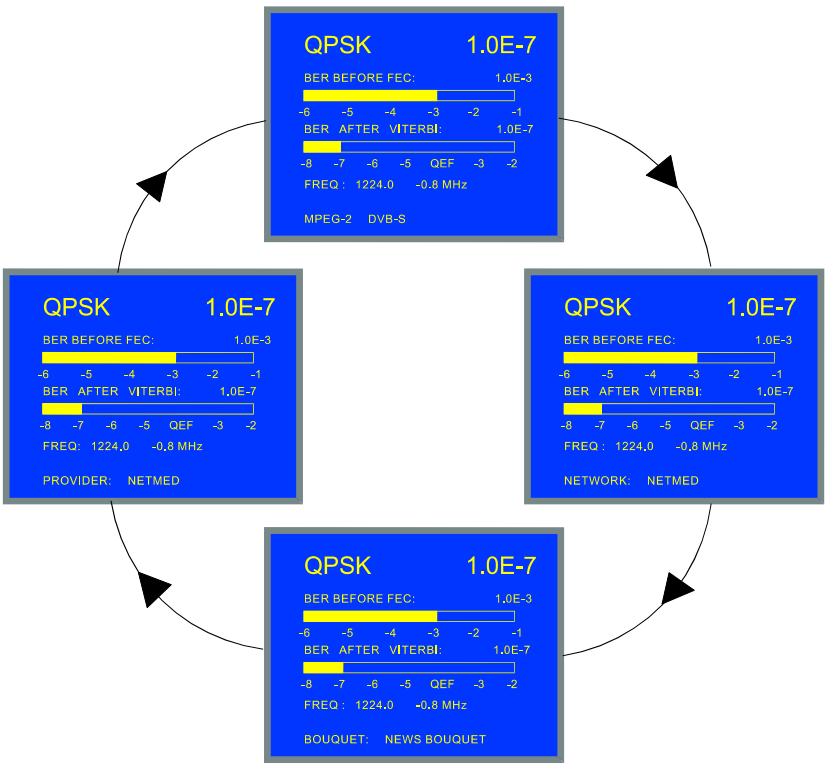
QPSK 1.0E-7
BER BEFORE FEC: 1.0E-3
-6 -5 -4 -3 -2 -1
BER AFTER VITERBI: 1.0E-7
-8 -7 -6 -5 QEF -3 -2
FREQ : 1224.0 -0.8 MHz
MPEG-2 DVB-S
QPSK 1.0E-7
BER BEFORE FEC: 1.0E-3
-6 -5 -4 -3 -2 -1
BER AFTER VITERBI: 1.0E-7
-8 -7 -6 -5 QEF -3 -2
FREQ: 1224.0 -0.8 MHz
PROVIDER: NETMED
QPSK 1.0E-7
BER BEFORE FEC: 1.0E-3
-6 -5 -4 -3 -2 -1
BER AFTER VITERBI: 1.0E-7
-8 -7 -6 -5 QEF -3 -2
FREQ : 1224.0 -0.8 MHz
NETWORK: NETMED
QPSK 1.0E-7
BER BEFORE FEC: 1.0E-3
-6 -5 -4 -3 -2 -1
BER AFTER VITERBI: 1.0E-7
-8 -7 -6 -5 QEF -3 -2
FREQ : 1224.0 -0.8 MHz
BOUQUET: NEWS BOUQUET

Figure 35.- DCI function. In this example the information coded by the operator on the **Provider** and **Network** fields is the same.

The information that appears in the ***Network***, ***Service***, ***Bouquet*** and ***Provider*** fields is responsibility of the Operator in charge of the tuned transponder. The **PROLINK-4/4C *Premium*** only decodes this information, if it is present, and shows it on the screen.

4.9.3 Decoding MPEG-2 / DVB Channels, access to Digital Services.

The **MPEG-2** is an **ISO/IEC** (**13818-1**) standard that defines the audio and video multiplexation in chains of bits form, grouped in fixed length *packets*. These standards offer two multiplexation layers: the first one (***Packetized Elementary Stream***) manages the synchronization between video and audio, whereas the second one depends on used transmission media. For error-free medias, this layer is the ***Program Stream***, whereas at not error-free medias is called ***Transport Stream***.

In digital television is used the **Transport Stream**, in which two types of packets can be distinguished clearly: those that content packetized video or audio, and those that content the information necessary to be able to accede to video or audio. These last ones form the specific information of the programs (***PSI***, ***Program Specific Information***), and allow to construct a series of tables that store the organization of the programs or services that there are in the ***Multiplex***, as well as data about their conditional accesses (in case they are encrypted).

The **DVB** standard adds to tables **MPEG-2** a few tables more than they offer very useful complementary information in the case of digital television, between which they emphasize the service table (***Service Description Table***), the network table (***Network Information Table***), and the bouquet table (***Bouquet Association Table***).

In the list of services they will appear all the present services in the service table according to the **ETS 300 468** standard. Therefore will appear the decodable services by any digital television decoding system that satisfies the **MPEG-2 / DVB** standard, as well as the data services, the utility reserved services by the operator, and even the discontinuous transmission services that, however, have been specified in the service table outside of its hours of transmission.

The specification for the **Service Information** in **DVB** systems, recommends that the table that contents the description of services (**SDT**, ***Service Description Table***), was faithful to services that at every moment are contained in the **Multiplex**. Even so, it is responsibility of the operator that content of this one and other tables is updated or that only correct information is contained.

When the **BER** measurement indicates acceptable reception quality (always to the left of the **QEF** level), and the identification information confirms that you have found the required channel, you will be able to ask for decoding some video and/or audio service.

English

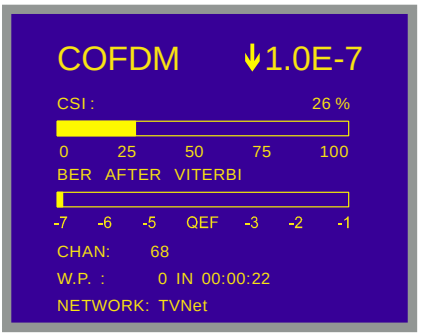

Figure 36.- Tuning a digital channel with acceptable **BER** level.

For decoding any service there are two possible procedures:

1) Go to the service list, option **service list** from functions menu in digital mode.

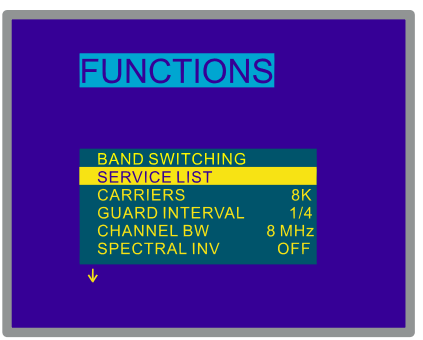

Figure 37.- Selecting the **service list** function (***SERVICE LIST***).

If the service table not has been totally acquired yet, they will show differents waiting messages (see figure 39). When it is available, will be showed all the services contained in **SDT** table, along with information about the service type, and with an asterisk (*) in case that the operator indicates one service partial or totally encrypted. If it appears in green colour it means that the identified service is not available, therefore it does not have audio nor video.

DTV	*Digital television service*
DR	*Digital radio sound service*
DAT	*Data broadcast service*
MOS	*Mosaic service*
-	*Type defined as reserved form by Provider*

Table 3.- Information about service type**.**

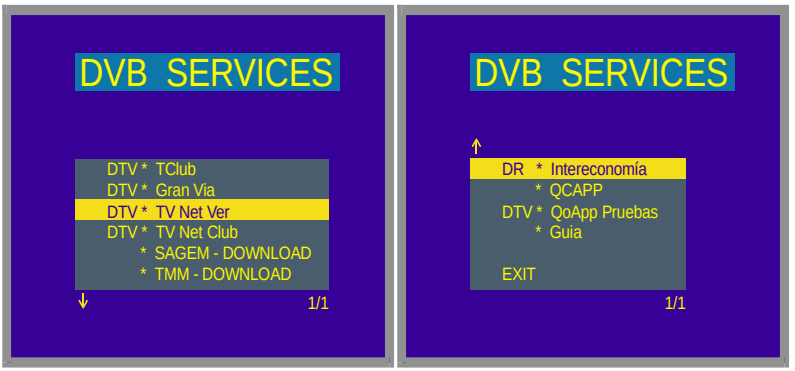

Figure 38.- Service table offered by Operator in the channel tuned**.**

2) Press the key [2] from **BER** measurement screen. If the service table has been acquired, the system will automatically go to decode the first service that contens video or audio. In opposite case, it will appear a first waiting screen while the process of data acquisition finalizes.

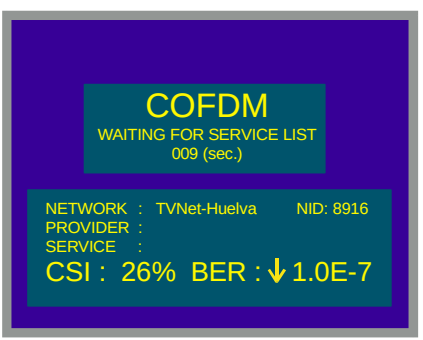

Figure 39.- Waiting screen

IMPORTANT REMARK

Is necessary to indicate that all the services do not contain accessible information for a digital television decoder. Acceding to the data services and the reserved ones, the most probable is than neither appears video nor audio.

English

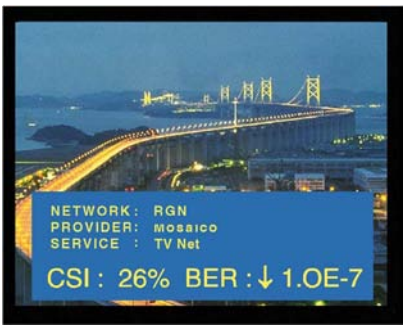

Figure 40.- MPEG-2 / DVB decoded channel*.*

Each ***Multiplex*** service can have more of an associated **audio** channel. By defect, when selecting a service will be selected first the audio one of available ones. In order to change the service audio, to press the button [26], it will appear the audio list of selected service. Each audio is identified with a label indicating the language if it is specified and a number corresponding to **PID** (packet identifier) of packets that contain the packet audio.

Figure 41.- Audio list of selected service*.*

In case of using one **RF** signal and one **TS** external input simultaneously, the **BER** information will talk about the demodulation of the **RF** signal, whereas all the identification information (even the service list) will refer about the external **TS**. If in this case it is required for visualizing digital video, also the one of the external **TS** will be decoded.

3) Once a service has been decoded, when turning the rotary selector [4] will appear the information referred to the type of **MPEG-2** received video. Therefore it is possible also, to directly visualise the video and the information associated to the list of services sequentially and cyclically.

Figure 42.- Description of the received **MPEG-2** video.

In the example of previous figure, **MP@ML** (*Main Profile and Main Level*) determines the profile of the standard **MPEG-2** which defines the compression rate of the digital service that is being decoded, whereas **4:3** corresponds to the picture resolution level.

The following data; **720x576 25 Hz** states the resolution (rows x columns) for the received video and the image frequency of refreshment.

Following table contains the configurations that the **PROLINK-4/4C *Premium*** can detect and appear shaded the combinations in which video picture visualisation is supported.

		PROFILES				
		Simple (SP)	**Main (MP)**	**SNR scalable (SNR)**	**Space sca. (Spt)**	**High (HP)**
LEVELS	**High HDTV standard (HL)**		1920 x 1152 80 Mb/s MP@HL			1920 x 1152 100 Mb/s HP@HL
	High 1440 HDTV-1440 (H14)		1440 x 1152 60 Mb/s MP@H14		1440 x 1152 60 Mb/s Spt@H14	1440 x 1152 80 Mb/s HP@H14
	Main SDTV (ML)	720 x 576 15 Mb/s SP@ML	720 x 576 15 Mb/s MP@ML	720 x 576 15 Mb/s SNR@ML		720 x 576 20 Mb/s HP@ML
	Low LDTV (LL)		352 x 288 4 Mb/s MP@LL	352 x 288 4 Mb/s SNR@LL		

Table 4.- Levels and profiles of **MPEG-2**. (*Max. and typ. values indicated*)

English

4.9.4 TV Mode Functions Menu

In TV operation mode, press the rotary selector [4] to access the functions menu of the TV mode:

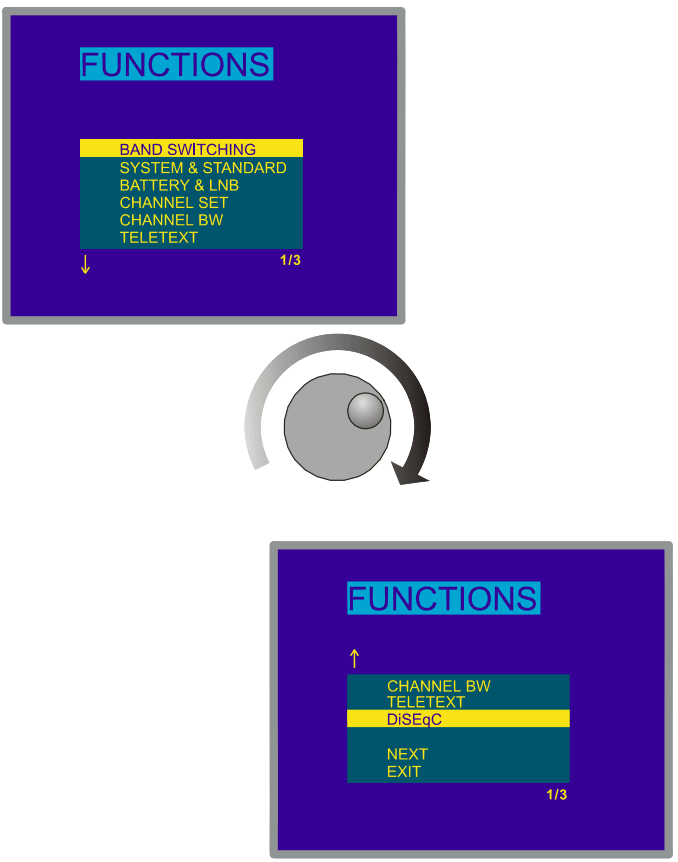

Figure 43.- TV mode functions menu.

Turn the rotary selector [4] to choose the different functions: turning it clockwise active option moves downwards while turning it anticlockwise active option moves upwards. The downwards or upwards facing arrow at the bottom or top-left hand side of the functions menu indicates there are more menus which can be accessed by turning the rotary selector clockwise or anticlockwise, respectively.

Below we describe the use of each function and its range of values.

4.9.4.1 Selection of the RF Band: (*Band switching*)

Permits to switch from terrestrial (5-862 MHz) to satellite band (900-2150 MHz) and viceversa.

4.9.4.2 Selection of the TV System and Standard (*System & Standard*)

This function enables the television system and standard to be changed. The standards which can be selected depend on the band in use (terrestrial or satellite channels). To change the standard access the TV mode functions menu, then turn the rotary selector [4] to the ***System & Standard*** function and press the rotary selector again [4]. A fold down menu will appear listing the following options:

Terrestrial bands	**Satellite band**
PAL-B/G	PAL
PAL-D/K	SECAM
PAL-I	NTSC
PAL-M	Digital (PAL)
PAL-N	
SECAM-B/G	
SECAM-L	
SECAM-D/K	
NTSC-M	
Digital (PAL)	

Turn the rotary selector [4] to the desired standard and press to activate it.

If a **digital** channel is selected, whether terrestrial or satellite, for the measurement of the level and the carrier-to-noise ratio to be correct, the bandwidth of the channel must be defined, using the ***Channel BW*** function of the functions menu.

In order to change the standard of the digital signals previously you must select the corresponding analogue standard.

The following table shows the features of the analogue terrestrial channel standards.

System	Lines/ frame	Channel Bandwidth	Video/sound separation	Video Mode	Audio Mode
B	625/50	7 MHz	5.5 MHz	Neg	FM
D	625/50	8	6.5	Neg	FM
G	625/50	8	5.5	Neg	FM
H	625/50	8	5.5	Neg	FM

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176
FAX 781.665.0780 - TestEquipmentDepot.com

System	Lines/ frame	Channel Bandwidth	Video/sound separation	Video Mode	Audio Mode
I	625/50	8	6.0	Neg	FM
K	625/50	8	6.5	Neg	FM
L	625/50	8	6.5	Pos	AM
M	525/60	6	4.5	Neg	FM
N	625/50	6	4.5	Neg	FM

Table 5.- Selectable terrestrial analogue standards and their characteristics.

4.9.4.3 Battery and External Units Power Supply *(BATTERY & LNB)*

This function allows you to check the charge state of the batteries, as well as the supply current and voltage of the external units. From the TV operation mode, simply press the rotary selector [4], select the **BATTERY & LNB** function and press the rotary selector [4] again. You will see a screen like the following one:

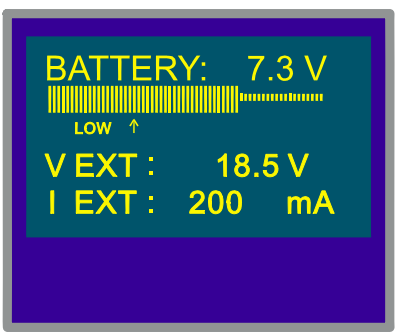

Figure 44.- Battery & Lnb function.

The top part of the screen displays the battery voltage (7.3 V in previous figure), both numerically and with a bar graph. The arrow labelled **Low** below the horizontal bar signals the low battery level where the battery should be charged. When batteries are fully charged, battery voltage indication is 7.4 V or higher.

The bottom of the screen shows the voltage supplied to the external units (**V EXT**, 18.5 V in the figure above) and the current supplied (**I EXT**, 200.0 mA in the example).

To leave this function press the rotary selector [4].

4.9.4.4 Datalogger Function

The **Datalogger** function allows the user to carry out, store and/or print out up to 9801 measurements in a fully automatic way. It may be understood as a measurement matrix whose columns address the 99 measuring configurations (defined in the 99 memories of the equipment) and whose lines permit to store 99 measurements for every measuring configuration (conducted in different points of the system or in the same point on different times).

Before to proceed to take measurements by means of the **Datalogger** function it is necessary to store the measuring configuration/s in the memory by using the **Store** function (see paragraph 4.12.1).

To select the **Datalogger** function activate the TV mode functions menu, by pressing the rotary selector [4] when in the TV operation mode. Then, turn the rotary selector [4] to the **Datalogger** field and press it, the **DATALOGGER** screen will appear automatically.

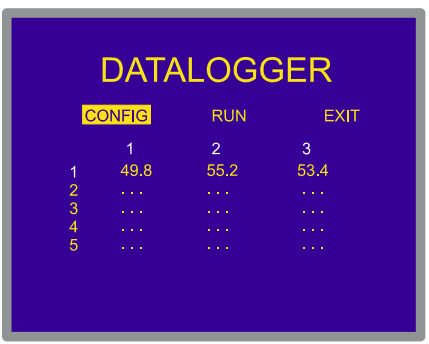

Figure 45.- DATALOGGER screen.

As you can see in the previous figure, the main screen of the Datalogger function has three functions: ***Config*** (Configuration), ***Run*** and ***Exit***. Below these three functions is the measurements matrix, three columns and five rows are simultaneously displayed (in the previous figure the datalogger has three stored measurements, one for each of the first three memories).

To access the various screen functions or fields press key -/-- [31] repeatedly.

4.9.4.4.1 Configuring the Datalogger Function.

The configuration menu of the **Datalogger** function allows you to choose between taking and/or printing measurements, programming the **PROLINK-4/4C *Premium*** to take measurements at a pre-determined time, defining the time interval between measurements, erasing all measurements stored in the **Datalogger** function, and automatically deactivating all the measurement configurations.

To define the configuration of the **Datalogger** function press key -/-- [31] repeatedly until you have selected the **Config** field and then press the rotary selector [4]. The configuration screen of the **Datalogger** function will then appear.

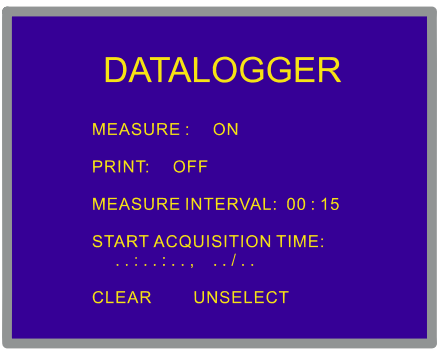

Figure 46.- Configuration of the DATALOGGER function

After an interval of half a minute without the **PROLINK-4/4C *Premium*** controls being touched, it will automatically return to the Datalogger function main screen.

1.- TO MEASURE, PRINT OR MEASURE AND PRINT?

First of all, the user must indicate whether he wants to take measurements or to print them, or to do both at the same time. To do this, press the -/-- [31] key repeatedly until positioned in the ***Measure*** field. Then turn the rotary selector [4] to activate (***On***) or deactivate (***Off***) the measurement function and press -/-- [31] key. The next step is to activate or deactivate the measurement printing function. To do this, use the key -/-- [31] to position the cursor in the ***Print*** field and activate it (***On***) or deactivate it (***Off***) turning the rotary selector [4] and pressing it validate the new state.

2.- MULTIPLE MEASUREMENTS: INTERVAL BETWEEN MEASUREMENTS

In the case of having to take multiple measurements at different times the **Measure interval** will have to be defined. This field specifies the time interval between measurements/print-outs. To define it, from the Datalogger configuration screen, repeatedly press key -/-- [31] until the section dealing with time in the **Measure interval** field has been activated, define the hours by turning the rotary selector [4], then press key -/-- [31] again to go to the minutes field and define these in the same way. Finally press key -/-- [31] again to validate the defined time interval.

You can make as many acquisitions as there are activated rows in the measurement matrix (if only one row has been activated, then only one measurement will be taken).

In the case where the **Datalogger** function has been programmed to take more than one measurement in the time domain, i.e. more than one row has been activated and the acquisition interval is greater than four minutes, then every time an acquisition is made the instrument will reprogram the alarm for the next measurement. Then it will switch itself on three minutes before the time defined in the Measure Interval field in order to warm up and ensure the highest accuracy.

3.- STARTING ACQUISITION (PROGRAMMING THE ALARM)

To program the instrument to take measurements and/or print-outs at a specific time, you must define the time and date the measurements are to be taken (**Start acquisition time**). If this field is not defined the acquisition of measurements will have to be activated manually (see section '*4.9.4.4.3 Taking Measurements*'). When programming the alarm be sure to have checked that the date and time have been correctly defined beforehand (**Clock** function, paragraph 4.9.4.5) and to have selected previously one measurement to be taken at minimum (see section '*4.9.4.4.2 Selecting the Measurement to be Taken*').

To define the starting time of measurement acquisition repeatedly press key -/-- [31] until the ***Start acquisition time*** field blinks, then press the rotary selector [4]. This will lead to a screen like the one shown below:

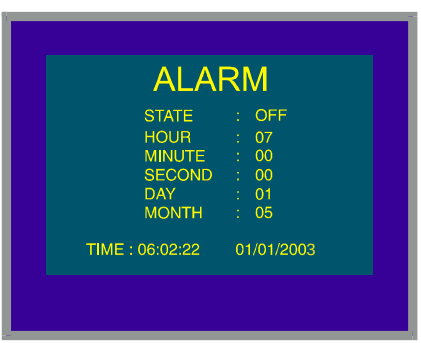

Figure 47.- Defining the starting time of measurement acquisition.

The first line of this screen tells you if the alarm function is on (***ALARM On***) or not (***ALARM Off***), followed by the date and time the alarm has been set for, and the last line shows the current time and date.

English

Repeatedly pressing key [31] cyclically activates the different fields in the following order: ***Hour***, ***Minute***, ***Second***, ***Day*** *and* ***Month***. To alter any of these simply activate it, turn the rotary selector [4] and press key [31] again. Once you have updated all the alarm fields, press the rotary selector [4] to validate them and exit the screen.

If before activating the alarm (**ALARM On**) no measurement matrix cell has yet been activated (see section '*4.9.4.4.2 Selecting the Measurements to be Taken*'), the bottom of the screen will show the error message "**NOT CELLS SEL.**" (No cells have been selected) followed by "**DL STOPPED**" (Datalogger deactivated).

On reaching the time defined in the ***Start acquisition time*** field, the instrument will switch itself on (if it was switched off) or go to the **Datalogger** mode (if switched on) to automatically take the measurements and/or produce the print-out.

4.- ERASING MEASUREMENTS STORED IN THE DATALOGGER AND AUTOMATIC DEACTIVATION OF ALL THE CELLS.

The configuration screen also allows you to erase all the measurements stored in the **Datalogger** function, as well as automatically deactivating all the activated measurement configurations. To erase the stored measurements select the ***Clear*** field and press the rotary selector [4]. To deactivate the measurement configurations select the ***Unselect*** field and press the rotary selector [4].

5.- EXITING THE CONFIGURATION SCREEN

To exit the **Datalogger** function configuration screen press the rotary selector [4].

4.9.4.4.2 Selecting the Measurement to be Taken

Once the **Datalogger** function has been configured, activate the measurement configuration(s) (columns) which you would like to use. The headings of the measurement matrix columns of the Datalogger function coincide with the number of memorised measurement configurations, simply place the cursor over each column and you will see the more important parameters displayed at the bottom of the screen (name assigned to the memory position, frequency/channel, measurement mode and units of measurement).

To activate the measurement configurations repeatedly press key [31] until the cursor is placed on the **columns** field, next turn the rotary selector [4] until it is positioned in the column (memory) that you wish to activate and press the rotary selector [4].The activated columns are more brilliant than the non activated ones. To deactivate a column follow the same steps as in activating it.

To activate rows where you wish to store measurements use key -/-- [31] to place the cursor on the **rows** field, then turn the rotary selector [4] until it is over the row you want to activate and press the rotary selector [4]. The activated rows are more brilliant than the non activated ones. To deactivate a row follow the same steps as in activating it. In the case of activating more than one row, the time interval between the measurement of each row is determined by the ***Measure interval*** parameter defined in the configuration screen (1 minute by default).

By means of the ***Acquisition*** function it is possible to carry out the measurements referred to the most characteristic digital signal parameters: BER or MER for QAM modulations; BER, CSI or MER for COFDM and MER, VBER (BER after Viterbi) or CBER (BER before Viterbi) for QPSK and DAB signals; CBER (Coded BER) and SNR. (see section '*4.12.1 Storing a Measurement Configuration (STORE)* ').

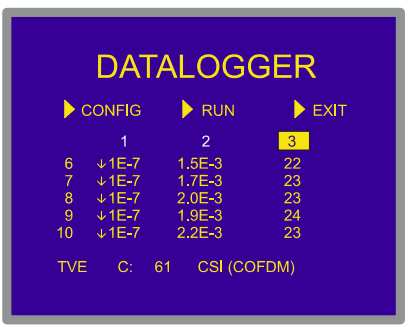

Figure 48.- Automatic measurements of the digital signals parameters.

4.9.4.4.3 Taking Measurements

In addition to execution by alarm (see section '*4.9.4.4.1 Configuring the Datalogger Function*') there are three more ways to take measurements:

a) Acquisition over a time period of a measurement
The measurement defined in a memory (column) will be taken as many times as there are activated rows, as specified by the time interval between measurements defined in the configuration menu (***Measure interval***).

Process: place the cursor on the column you want and press the rotary selector [4] until the first active cell is highlighted. If no measurement matrix row has been previously activated, the bottom of the screen will show the error message "NOT CELLS SEL." (No cells selected).

b) Acquisition of different measurements at the same moment.
Multiple measurements in a row will be taken, as specified by the measurement configurations defined in all the activated columns.

English

Process: place the cursor on the row you want and press the rotary selector [4] until the active cells are highlighted. If no measurement matrix column has been previously activated, the bottom of the screen will show the error message "NOT CELLS SEL.".

c) Multiple acquisitions.
All the measurements defined by all the activated rows and columns will be taken, in the case where more than one row has been activated the time interval between measurements will be that defined in the ***Measure interval*** field of the configuration menu.

Process to start the acquisition: select the ***Run*** function and press the rotary selector [4]. If no measurement matrix element has been previously activated, the bottom of the screen will show the message "NOT CELLS SEL.".

If any key or the rotary selector is pressed during the acquisition process, the acquisition process will abort and the screen will display the message "DL STOPPED" (Datalogger deactivated).

4.9.4.4.4 Exiting the Datalogger Function

To exit the Datalogger function select the Exit field using key

[31] then press the rotary selector [4].

4.9.4.4.5 Example of Datalogger Function Applications.

The **Datalogger** function has many applications such as channel equalisation and measuring signal attenuation at each pickup.

Band Equalisation (frequency acquisition)

For this application you will need to use a noise generator as the signal source in the place of a receiver antenna. If, lets say, you wish to verify equalisation on the VHF band, then:

1. Define the following tuning frequencies at 8 memory positions: from 50 to 450 MHz in 50 MHz steps. The measurement to be taken will be the level measurement.

2. In the Datalogger function, activate the columns related to the memories defined in the previous step.

3. Next place the cursor on the row where you want to store the measurements and press the rotary selector [4] until the first of the cells blinks.

The measurements obtained will allow you to verify if the signal level is uniform across the entire band.

Measuring signal level fluctuation at a pickup (acquisition over a time period)

1. Define the acquisition time interval ***Measure interval*** (1 h for example).

2. Activate a column (a measurement configuration you consider significant).

3. Activate the necessary number of rows to be able to perform the study over the decided upon period of time, taking into account the previously defined acquisition interval (e.g. for a 24 hour study with an acquisition interval of 1 h you will need to activate 24 rows).

4. Finally place the cursor on the activated column and press the rotary selector [4] until the first active cell blinks.

The report obtained will allow you to guarantee the correct operation of the installation.

4.9.4.5 Clock

An internal clock permits to record date and hour of data acquisitions.

To modify the time/date access the TV mode functions menu, turn the rotary selector [4] to the ***Clock*** function and press to activate it. The monitor will show a screen labelled CLOCK displaying the *hour*, *minute*, *second*, *day*, *month* and *year*.

To alter any parameter repeatedly press key -/-- [31] until the parameter you want to modify appears shadowed, then turn the rotary selector [4]. If you want to alter more parameters repeatedly press key -/-- [31] again. To validate the changes made and exit press the rotary selector [4].

4.9.4.6 Input Video

The **Input video** function enables Scart connector signals to be controlled. There are four possibilities:

Scart Auto	Normal Scart operation
Scart In	Input video operation mode
Scart Out	Output video operation mode
Scart Off	Scart deactivated

To select the Scart operation mode, access the TV mode functions menu, turn the rotary selector [4] to the ***Input video*** function and press to activate it. The monitor will show a screen labelled **INPUT VIDEO** displaying the four available options (as well as the Exit option). Turn the rotary selector [4] to the mode you require, then press to activate it.

English

4.9.4.7 Selecting the Channels Table (*Channel set*)

The **PROLINK-4/4C *Premium*** comes with eighteen stored channel tables as standard (four for terrestrial television and fourteen for satellite), for greater adaptability to the selection requirements of different countries or zones. See the channel-frequency table in appendix A of the manual.

To modify one channel table, access the TV mode functions menu, turn the rotary selector [4] to the ***Channel set*** function and press to activate it. The monitor will then show the **CHANNEL SET** screen. Turn the rotary selector [4] to the desired table and then press the rotary selector [4] again to activate.

4.9.4.8 Measurement Units

The **PROLINK-4/4C *Premium*** offers three measurement units to measure level and channel power: ***dBµV***, ***dBmV*** and ***dBm***.

To select the units of measurement, access the TV mode functions menu, turn the rotary selector [4] to select the ***Units*** function and press to activate it. The monitor will show a screen labelled **UNITS** displaying the three available options (as well as the Exit option). Turn the rotary selector [4] to the units you require, then press to activate it.

4.9.4.9 Power Off Mode (*Manual power*)

The **PROLINK-4/4C *Premium*** offers two power-off modes: ***Manual*** and ***Automatic*** (unit disconnects automatically after 15 minutes without operating on any control).

To select the power-off mode, access the TV mode functions menu, turn the rotary selector [4] to select the ***Manual power*** function and press to activate it. The monitor will show a screen labelled **POWER OFF** displaying the two available options (as well as the ***Exit*** option). Turn the rotary selector [4] to select the power-off mode you require, then press to activate it.

4.9.4.10 C/N setup

To measure C/N the **PROLINK-4/4C *Premium*** offers two different modes in TV mode:

C/N (Auto) — The **PROLINK-4/4C *Premium*** defines automatically the frequency where noise level is measured, according with:
$f_{noise} = f_{tuning} - ½$ *Channel BW*.

C/N (Reference noise) — The user defines the frequency where noise level is measured (by means of the **Reference noise** function). This frequency will be used to measure noise level for all channels.

To select C/N mode, access the TV mode functions menu, turn the rotary selector [4] to the ***C/N setup*** function and press to activate it. The monitor will show a screen labelled **C/N SETUP** displaying the two available options (as well as the ***Exit*** option). Turn the rotary selector [4] to the mode you require, then press to activate it.

4.9.4.11 Channel Bandwidth *(Channel BW)*

To measure the power and C/N ratio of digital channels, as well as the C/N ratio of satellite band channels, you first need to define the channel bandwidth.

To modify the bandwidth access the TV mode functions menu and select the ***Channel BW*** function, press the rotary selector [4] to activate it. The **CHANNEL BANDWIDTH** screen will be displayed. To alter the bandwidth value press key -/-- [31], the bandwidth will disappear and, using the keyboard, you will be able to enter the new digital channel bandwidth in MHz and with two decimals.

4.9.4.12 LNB Local Oscillator Frequency *(Lnb local osc)*

This option only affects reception of satellite band signals when using the channel tuning mode. This function defines the LNB local oscillator frequency used in the installation where the **PROLINK-4/4C *Premium*** has been connected. Given that the **PROLINK-4/4C *Premium*** satellite channel tables have been defined in the Ku band and the **PROLINK-4/4C *Premium*** tunes in IF (like all satellite receivers) the LNB local oscillator frequency has to be defined to correctly tune the channel mode.

To modify this parameter access the TV mode functions menu (satellite band), turn the rotary selector [4] to the ***Lnb local osc*** function and press to activate it. The monitor will show a screen labelled **LNB LOCAL OSCILLATOR** displaying the current value of the LNB local oscillator frequency. To alter this value press key -/-- [31], the current value will disappear and the new value can now be entered using the keyboard.

The frequency of the LNB local oscillator is expressed in MHz, with 5 figures for the whole part, a decimal point and a decimal figure (which acts as confirmation). For example, to select 9 GHz the number **9000.0** has to be entered. Values must be defined between 8000.0 and 12000.0.

4.9.4.13 Video Polarity

This option affects reception of SAT (satellite) band signals. It allows selection of either negative and positive video polarity.

To modify the polarity access the TV mode functions menu (satellite band), select the ***Video Polarity*** function, and press the rotary selector [4] to activate it. The monitor will show a screen labelled **POLARITY** displaying two possibilities: ***Positive Video*** and ***Negative Video***. Turn the rotary selector [4], mark the option you require and finally press to activate.

English

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176

FAX 781.665.0780 - TestEquipmentDepot.com

4.9.4.14 Verification of distribution networks (*SAT IF Test*)

This application allows to verify easily the TCI features (Telecommunications Common Infrastructures) before the antennas and the head-end devices are operative. The procedure allows to evaluate the frequency response of a whole FI distribution network by means of two steps:

NOTE: For this application the use of **PROMAX**'s **RP-050** FI simulator is suggested, for which it has been specially designed.

1.- CALIBRATION

Connect the **RP-050** directly to the **PROLINK-4/4C *Premium*** using the BNC-F adapter.

Power on the **RP-050** through the **PROLINK-4/4C *Premium***, it is necessary to set the **External supply** function (see section '*4.8 External Units Power Supply*') pressing key [27], and the rotary selector [4] for setting a voltage of 13 V.

Finally, select the **SAT IF TEST** application on **FUNCTIONS** menu from TV mode and SAT band, when it appears the screen from figure 49, press the rotary selector [4] to accede to the **FUNCTIONS** menu and using the rotary selector [4] to accede to the **Calibrate** function (figure 51). Wait for some seconds until the calibration process is completed shown by a white square crossing through the three pilot frequencies.

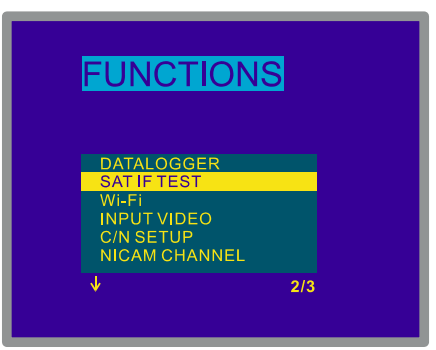

Figure 49.- Sat IF test selection, (satellite band, analogue channels).

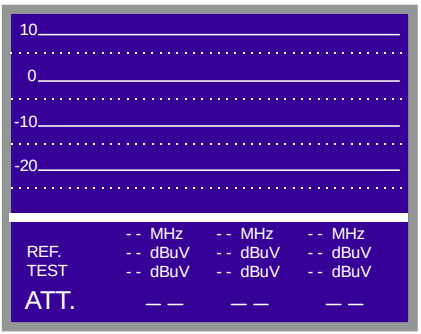

Figure 50.- Sat IF test.

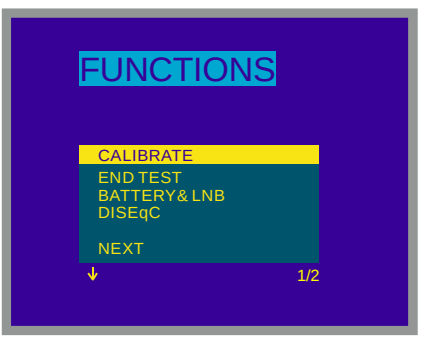

Figure 51.- Calibrate function selection for Sat IF Test.

English

2.- MEASUREMENT OF THREE PILOTS THROUGHOUT THE NETWORK

Once **PROLINK-4/4C *Premium*** has been calibrated, connect the **RP-050** to the point where it will be connected the satellite dish (signal source) and start to take level measurements in the different distribution outlets using the **PROLINK-4/4C *Premium***. On the screen will appear the attenuation values for the three pilot frequencies measured in the outlet plug (see the following figure).

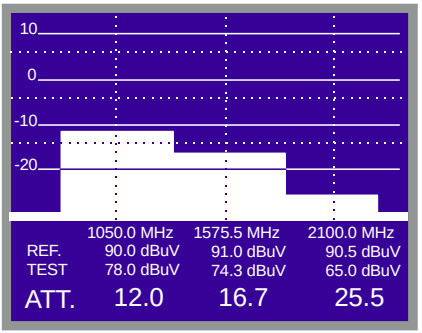

Figure 52.- Attenuation measurements in a plug.

In order to finish of measuring, press the rotary selector [4] and select from **FUNCTIONS** menu the **End Test** option.

4.9.4.15 Verification of Wi-Fi systems (*Wi - Fi*)

This application allows to verify the response of the **Wi-Fi** communication networks (*Wireless Fidelity*), that is a communication standard for wireless connectivity based on the IEEE 802.11b/g protocol, by means of the spectrum monitoring of used frequency band and the discrimination among the active channels. The procedure implies the following steps and elements:

REMARK: For this application is advised to use the **PROMAX CV-245** frequency converter, for which it has been specially designed.

1.- INSTALLATION

Connect the **CV-245** to the **PROLINK-4/4C *Premium*** directly by means of connector-adapter BNC-F.

Power supply the **CV-245** through the **PROLINK-4/4C *Premium***, for it select the **Ext. supply** function (see section '*4.8 External Units Power Supply*') by means of pressing the key [27] and the rotary selector [4] select a voltage of 13 V.

IMPORTANT REMARK: Using power supply voltages higher than 13 V should be avoided due to that could damage the **CV-245** converter.

Select the **Wi-Fi** application from **FUNCTIONS** menu in TV mode and SAT band, when the selection screen is shown (Figure 53), press the rotary selector [4] on the **Wi-Fi** option to enter to the display screen for the band frequency spectrum corresponding to 14 channels (from 2412 to 2484 MHz) at the ISM band (2400 to 2483.5 MHz) that operate with **CSMA/CA** (*Carrier Sense Multiple Access/Collision Avoidance*) accessing.

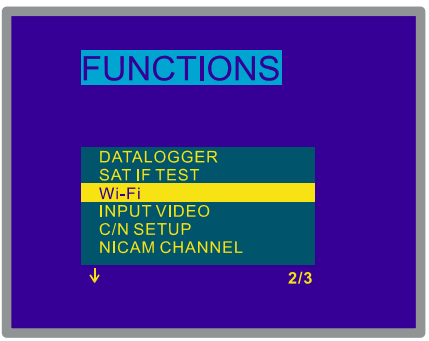

Figure 53.- Wi-Fi function selection (satellite band).

A screen with the spectral representation of the **Wi-Fi** frequency band will appear. Move the marker by means of the rotary selector [4] to locate it in each frequency or channel and to obtain the measurement of the existing power.

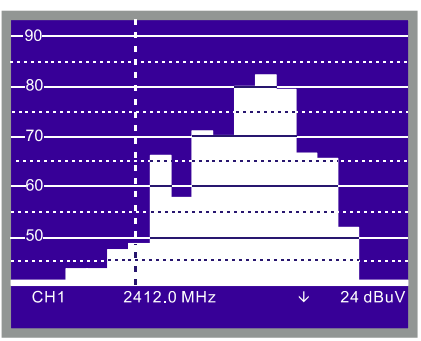

Figure 54.- Wi-Fi band spectrum representation.

Press the key [2] to access to a screen with the following measurements corresponding to the frequency or channel indicated by the marker:

- **Signal Strenght**: Measurement of the existing power value.
- **Peak**: Holds the last acquired maximum of the signal power.
- **Max. Peak**: Holds the registered maximum value.

English

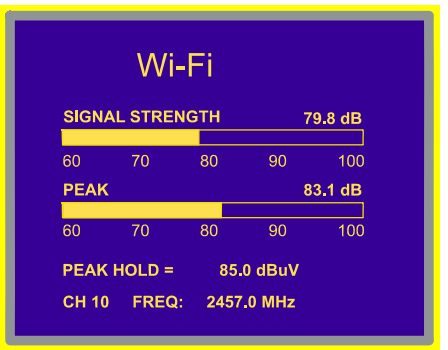

Figure 55.- Wi-Fi power measurements.

When turning the rotary selector [4] a change of the frequency or channel tuned is made, updating the visualised measures.

REMARK: When the spectrum analyser mode is used, it is advisable to set a suitable value for the input level by means of the ***Reference Level*** function (see section 4.10.1.3). Also the acquisition mode Maximum Hold must be set using the **Acquisition mode** function from the functions menu.

In order to close the measurement press the rotary selector [4] and select the **End Wi-Fi** option from the **FUNCTIONS** menu.

4.9.4.16 Input TS

The **Input TS** function enables the *Transport Stream MPEG-2 / DVB* signals to be controlled. There are three possibilities:

Automatic Represents the TS coming from the input connector [40] or otherwise, from the internal demodulator.

Internal TS Represents the TS generated by the internal demodulator.

External TS Represents the external TS coming from the input connector [40].

To select the Scart operation mode, access the TV mode functions menu for digital channels, turn the rotary selector [4] to the ***Input TS*** function and press to activate it. The monitor will show a screen labelled **TRANS. STREAM** displaying the three available options (as well as the Exit option). Turn the rotary selector [4] to the mode you require, then press to activate it.

4.9.4.17 NICAM Channel

Use this function to verify NICAM sound modulations in stereo and dual, you can also select the sound channel coming over the speaker.

To change the decoded channel access the TV mode functions menu, select the ***Nicam channel*** function, and press the rotary selector to activate it. The monitor will show a screen labelled **NICAM** offering two possibilities: ***Channel A*** and ***Channel B***. Turn the rotary selector [4] to the desired option and finally press to activate.

4.9.4.18 Search Level

Use this function to modify the threshold level of the automatic station search. To change the level place the cursor on the ***Search level*** field and press the rotary selector [4]. The monitor will display a window showing the current value of the search level, to alter it press key -/-- [31] and enter the new value on the keyboard. Confirmation is automatic on entering the second digit.

4.9.4.19 Teletext

When the ***Teletext*** function is selected, Teletext information appears on the monitor if a transmitter with this information is tuned. The first page to appear on the screen is always page 100. If Teletext data is received, a counter located on the upper edge of the screen indicates the page that is being processed. To change active page press key -/-- [31] and introduce the new number using the numeric keyboard (third digit acts as confirmation).

If the page requested is not included in the Teletext service of the transmitter, the search will continue indefinitely. In such a situation the user can halt the search process, either by entering a new page number or by exiting the Teletext function pushing any control relative to another function.

The Teletext function is especially valuable for the final optimization process in TV installations. Any interference or reception through indirect beams generates digital in the digital information of the Teletext, which are highly visible as erroneous characters on the screen.

4.9.4.20 DiSEqC Command Generator

DiSEqC[6] ('*Digital Satellite Equipment Control*') is a communication protocol between the satellite receiver and the accessories of the installation (switches, LNBs, etc.) proposed by Eutelsat, with the aim to standardize the diversity of switching protocols (13 - 15 - 18 V, 22 kHz, 60-400 Hz) and to satisfy the demands of the digital TV installations.

6 *DiSEqC™ is a trademark of EUTELSAT.*

English

To define and/or to send a DiSEqC commands sequence, from the TV operation mode, press the rotary selector [4], select the ***DiSEqC*** function and press it again. A screen like next one will appear:

Figure 56.- DiSEqC programs screen.

This screen shows a list containing up to 6 **DiSEqC** programs, appearing the first memory positions preset to facilitate the more used commutation operations (the rest appears by default with name UNTITLED) which may be edited for execution.

To edit a program, turn the rotary selector placing the pointer over the program editing position and press to access the **DiSEqC** commands editing screen.

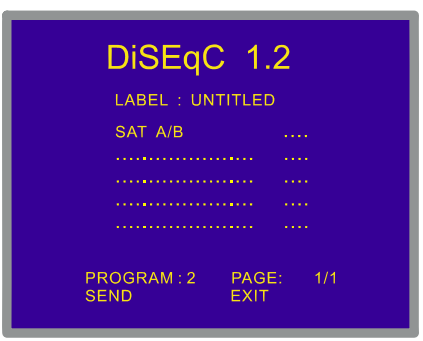

Figure 57.- DiSEqC commands screen.

DiSEqC screen is divided in 3 areas: the field to edit the **DiSEqC commands sequence** (only command *Sat A/B* in previous figure), **Send/Clear** functions and **Exit**.

Fill in the **LABEL** field with the program name: turn the selector to display the different characters in alphanumerical order and press to pick the character you need.

To define the **DiSEqC commands sequence** press key -/-- [31] repeatedly until cursor is positioned on one line of the commands sequence (the line will blink). If cursor has been placed on the first empty line, *Sat A/B* command will appear (first DiSEqC command of table 6). To select a different command turn the rotary selector until the desired command appears and then press it.

Some DiSEqC commands need to define an associated parameter (i.e. *On/Off*, a numerical value, *A/B*...), when any of these commands is selected first option for the associated parameter appears automatically at its right, to change it turn the rotary selector and to validate it press the rotary selector (see DiSEqC commands table).

Once the DiSEqC command is defined, the cursor will pass to the following line, if you want to define a new command proceed as for the first one, if you do not want to add any command press key -/-- [31].

After the commands sequence is created it is possible to modify it. To modify the sequence press key -/-- [31] repeatedly until you have positioned the cursor on the command you want to make the change and then press the rotary selector [4]: ***Insert*** function will appear on the screen, by turning the rotary selector it is possible to select ***Delete*** and ***Edit*** functions. Once the desired function appears on the screen (*Insert*, *Delete* or *Edit*) press the rotary selector. If you select ***Delete*** function the command will be removed from the sequence, if you select ***Insert*** or ***Edit*** functions, you must define the new command as previously described.

Once commands sequence is defined, to send it to the peripherals press key -/-- [31] repeatedly until you have selected the ***Send*** function and then press the rotary selector [4]. At the same time as DiSEqC commands are sent these appear on the lower side of the monitor. If ***Send*** function does not appear on the monitor, place the cursor over the ***Clear*** function and turn the rotary selector.

It is possible to delete the whole of the commands sequence, to do this press key -/-- [31] repeatedly until you have selected the ***Clear*** field and then press the rotary selector [4]. If ***Clear*** function does not appear on the monitor, place the cursor over the ***Send*** function and turn the rotary selector.

To exit DiSEqC function place the cursor over the ***Exit*** field and then press the rotary selector [4].

REMARK: When disconnecting the unit, the commands sequence will NOT be lost.

It is possible to execute a specific **DiSEqC** program using a direct access key (see *'4.13 Direct Access to Functions'*). This enables you to change specific configurations from the **Spectrum Analyser Mode**, useful during the parameter adjustment process in an installation.

English

It is also possible to execute **DiSEqC** programs using the **Datalogger** function if their names are included in the automatic reading acquisition sequence (see *'4.12.1 Storing a Measurement Configuration (STORE)'*).

Next table shows the DiSEqC commands available:

Character	Command	Associated parameter
General	**Sat A/B**	A/B
	Reset	---
	Power on	---
	Standby	---
Assigned Switch	**L.O. frequency**	High/Low
	H/V polarisation	H/V
	Position A/B	A/B
	Sw. option A/B	A/B
Non-assigned Switch	**Switch 1**	A/B
	Switch 2	A/B
	Switch 3	A/B
	Switch 4	A/B
Positioner	**Halt**	---
	Disable limits	---
	Enable limits	
	Limit East	---
	Limit West	---
	Drive E. seconds	1 to 127
	Drive E. steps	1 to 128
	Drive W. seconds	1 to 127
	Drive W. steps	1 to 128
	Store position	1 to 255
	Goto position	1 to 255

Table 6.- DiSEqC commands.

4.9.4.21 Beep

This function allows the user to switch the audible indicator ON and OFF. To do this, first select the TV mode functions menu, then choose the ***Beep*** function using the rotary selector [4] and press. The monitor will show the **BEEP** screen and by turning the rotary selector it will be possible to select between ***Beep ON*** or ***Beep OFF***. To validate press it again.

4.9.4.22 Equipment Information

This function displays information on the instrument. To activate it, press the rotary selector [4] while in the TV operation mode. Turn the rotary selector [4] to the **Equipment Info.** function and press. The monitor will show the **EQUIPMENT INFO.** screen listing several informations such as the instrument serial number (Serial Number), the version of the control program (Version), etc.

To exit the function press the rotary selector [4].

4.9.4.23 Exit

Exits from the TV functions menu.

4.10 Spectrum Analyser Operating Mode

The Spectrum Analyser mode allows the user to discover the signals present in the frequency band in quickly and easily and to make measurements at the same time. To select it press key [21]. The monitor will show a picture like the one described in the next figure.

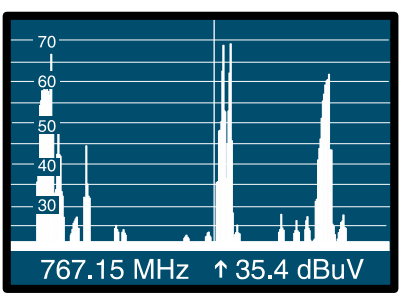

Figure 58.- Spectrum Analyser mode.

The horizontal lines define the signal level, the broken lines being separated a distance equals to the half value defined by the dynamic range (See function ***Dynamic Range***). The level of the top line (70 dBµV in previous figure), named the ***Reference Level***, can be altered using the Reference level function in the Spectrum Analyser mode functions menu over a range from 10 dBµV to 130 dBµV by steps of 10 (section 4.10.1.3).

English

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176

FAX 781.665.0780 - TestEquipmentDepot.com

The signal level for each frequency is displayed vertically, the lower frequencies appearing at the left of the screen and the higher ones at the right. The amplitude of the lobes is calibrated. In the example in previous figure the noise level is at around 20 dBµV and the lobe with the highest signal level (second from the right) is at 69 dBµV.

The frequency range displayed (called **span** from hereon) can also be altered using the Spectrum Analyser mode functions menu.

Also, it is possible to define the detection mode (peak or average) by means of the ***Detection Mode*** function, it affects the form in which the spectrum appears in screen. The Peak mode is used for the detection of analogue modulations whereas the average mode is more suitable to detect the digital modulations.

A vertical broken line, called **marker**, appears on the spectrum display to identify the tuned frequency.

One of the applications of the **PROLINK-4/4C *Premium*** operating as Spectrum Analyser is in the search for the best orientation and position of the receiving antenna. This is particularly important in UHF. Because such frequencies are involved, with wavelengths ranging from 35 cm to 65 cm, if the antenna is shifted only a few centimetres, the relationship between the picture, chrominance and sound carrier frequencies change, affecting the quality of the picture in the receiver.

If there is an excess of sound carrier, tearing or 'moiré' may appear on the screen due to the frequency beats between the sound, chrominance and the picture frequencies.

If there is a chrominance carrier defect, then the television colour amplifier must function at maximum gain, which could result in noise appearing all over the television screen with points of colour that disappear when the saturation control is reduced; in an extreme case, loss of colour may occur.

4.10.1 Spectrum Analyser Mode Functions Menu

In the Spectrum Analyser operation mode, pressing the rotary selector [4] leads you to the next functions menu.

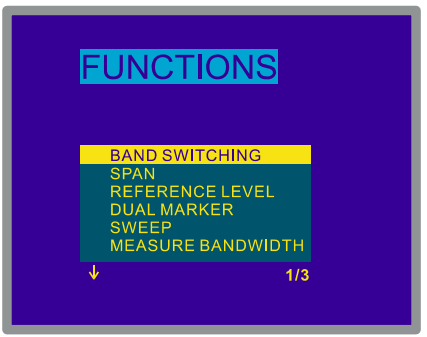

Figure 59.- Spectrum Analyser mode functions menu.

When turning the rotary selector clockwise active option moves downwards while turning it anticlockwise active option moves upwards.

The downward pointing arrow at the bottom left of the menu means that there are more functions available, to view these turn the rotary selector clockwise. Below we describe the use of each function and its range of values.

English

4.10.1.1 Band Switching

Permits to switch from terrestrial (5-862 MHz) to satellite band (900-2150 MHz) and vice versa.

4.10.1.2 Span

This function enables selecting the displayed screen frequency range in Spectrum Analyser mode between ***Full*** (the entire band), ***500 MHz***, ***200 MHz***, ***100 MHz***, ***50 MHz***, ***32 MHz***, ***16 MHz***, ***8 MHz*** and ***4 MHz*** (the latter one only in terrestrial bands).

To alter the **span**, select the functions menu, then turn the rotary selector [4] to the ***Span*** function and press it. The screen will show a window with the spans which can be selected. Turn the rotary selector [4] to the required span and activate it by pressing the selector again.

4.10.1.3 Reference Level

The reference level corresponds to the level marked by the top horizontal line appearing on the Spectrum Analyser mode screen. This function enables the reference level to be defined between **10** and **130 dBµV** in **10 dB** steps. The default reference level is 70 dBµV.

To alter the value of the reference level select the Spectrum Analyser mode functions menu, turn the rotary selector [4] to select the ***Reference level*** function and press it. The screen will show a window with the values which can be selected. Turn the rotary selector [4] to the desired reference level and activate it by pressing the selector again.

4.10.1.4 Dynamic Range

It allows to zoom in or to zoom out the visualization vertical scale by means of selecting the following values for the screen divisions: **2**, **5** and **10 dB/div**

4.10.1.5 Dual Marker/Single Marker

(Only for level measurements) This function enables two tuning markers (***Dual marker***) to be seen on the spectrum display. When you choose this option you can select the active marker (***Marker B ➔ A*** or ***Marker A ➔ B***) or return to using only one marker (***Single marker***).

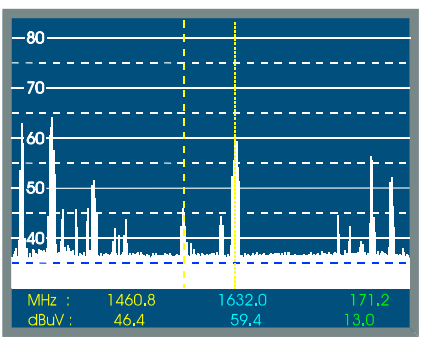

Figure 60.- Spectrum Analyser mode with two tuning markers.

When you select the ***Dual marker*** function, the bottom of the screen displays the frequency of each of the two markers, the signal level for each frequency and, on the far right, the frequency difference and the level between them.

4.10.1.6 Sweep

It offers the possibility of selecting the Spectrum mode sweep rate: **High Resolution** (slow sweep, high precision), **Fast** (fast sweep, low precision) and **Antenna Alignment** (for faster sweep antenna alignment without numeric representation).

To modify the sweep speed select the Spectrum Analyser mode functions menu, then turn the rotary selector [4] to the ***Sweep*** function and press. The screen will show a window containing all the values which may be chosen. Turn the rotary selector [4] to the desired speed and activate it by pressing the selector again.

4.10.1.7 Reference Noise (Carrier ➔ Ref. Noise)

(Only in *C/N* measurements). Permits to define the frequency where noise level will be measured.

To modify the frequency where you want to measure noise level, accede to the menu functions and select the ***Carrier ➔ Ref. noise*** function then, again in the Spectrum mode, turn the rotary selector to place the marker on the frequency where you want to measure the noise level or well, press key -/-- [31], current reference noise frequency will be erased and using the keyboard introduce the new value. Finally accede to the functions menu again and execute the ***Ref. Noise ➔ Carrier*** function so that you can tune new carrier frequencies by turning the rotary selector.

4.10.1.8 Channel Bandwidth (Marker ➔ Channel BW)

(Only in *Channel Power* measurements). Permits to define channel bandwidth.

To modify the channel bandwidth, that is to say the power integration limits, accede to the menu functions and select the ***Marker ➔ Channel BW*** function then, again in the Spectrum mode, turn the rotary selector to modify it or well press key -/-- [31], current channel bandwidth will be erased and using the keyboard introduce the new value. Finally accede to the functions menu again and execute the ***Channel BW➔ Marker*** function so that you can tune new carrier frequencies by turning the rotary selector.

4.10.1.9 Marker (Channel BW ➔Marker)

(Only when measuring *Channel power* and after defining the ***Channel bandwidth***). Permits to change the tuning frequency by means of the rotary selector.

4.10.1.10 Carrier (Ref. Noise ➔ Carrier)

(Only when measuring *C/N Referenced* and after defining the ***Reference noise***). Permits to change the tuning frequency by means of the rotary selector.

4.10.1.11 Bandwidth of the Spectrum Measuring Filter *(Measure bandwidth)*

The frequency resolution of the Spectrum Analyser mode is determined by the bandwidth of the measuring filter when displaying the spectrum. This parameter is fundamental given the increasing density of channels present in all TV transmission systems.

English

To alter the bandwidth of measurement select the Spectrum Analyser functions menu, then turn the rotary selector [4] to the ***Measure bandwidth*** function and press. The screen will show a window displaying the values which can be selected. Turn the rotary selector [4] to the chosen bandwidth and activate it by pressing the selector again.

The choice of bandwidth is:

Terrestrial channels:	**50 kHz**, **230 kHz** or **1 MHz**
Satellite channels:	**50 kHz**, **230 kHz** or **4 MHz**

Filters with the greatest bandwidth (4 MHz y 1 MHz) allow you to take more stable measurements, as well as being able to distinguish between analogue and digital carriers. The 4 MHz filter is ideal for level measurements on the satellite band. The 230 kHz and 50 kHz filters are recommended for measuring terrestrial television, cable television and MMDS signals. They also allows you to identify smaller bandwidth signals such as NICAM sound carriers (terrestrial analogue channels), to detect the beacon signal on VSAT, the separation between the audio FM carrier, and between the stereo sub-carriers in television.

4.10.1.12 Acquisition mode

Offers three acquisition modes: *Maximum Hold*, *Minimum Hold* and *Continuous* (by default).

4.10.1.13 Detection mode

Offers two detection modes: *Average* and *Peak* (by default).

4.10.1.14 Selecting the Channels Table *(CHANNEL SET)*

See 4.9.4.7 section.

4.10.1.15 Batteries and External Units Power Supply *(BATTERY & LNB)*

See 4.9.4.3 section.

4.10.1.16 Exit

Exits from the Spectrum Analyser function menu.

4.10.2 Selecting the Measurement Mode

The Spectrum Analyser mode permits to make different measurements at the same time you see the signals present in the band. The types of measurements available are:

Terrestrial band - Analogue channels:

Level Level measurement of the currently tuned carrier.

C/N Video carrier to noise ratio referenced to a *noise frequency* defined by the user through the ***Reference Noise*** function.

Terrestrial band - Digital channels:

Channel power *Integration method*. It consists of scanning the entire channel, calculating the contribution of each portion of the spectrum to the whole.

C/N *Referenced*: Channel level to noise ratio referenced to a *noise frequency* defined by the user through the ***Reference Noise*** function.

Satellite band - Analogue channels:

Level Level measurement of the currently tuned carrier.

C/N Video carrier to noise ratio referenced to a *noise frequency* defined by the user through the ***Reference Noise*** function.

Satellite band - Digital channels

Channel power *Integration method*.

C/N *Referenced*: Channel level to noise ratio referenced to a *noise frequency* defined by the user through the ***Reference Noise*** function.

Like in the TV mode, to select the type of measure, press key [22] then turn the rotary selector [4] until desired mode is marked and finally press the rotary selector [4] or key [22] to activate the new measurement mode.

4.10.2.1 Measuring Carrier Levels *(Level)*

(Only for analogue channels). When selecting this mode on the lower part of the image appears the tuned frequency (or channel) and the signal level at this frequency. If dual marker function is selected, tuned frequency and signal level are showed for each one of the markers and, on the far right, the frequency difference and the level between them.

4.10.2.2 Measuring the Carrier / Noise ratio (*C/N Referenced*)

The Carrier/Noise ratio in Spectrum mode is always referenced to a noise frequency defined by the user.

Imagine a situation like the one shown in the next figure: a digital channel (8 MHz BW) adjacent to an analogue channel. When measuring C/N for the digital channel in TV mode using the *Auto setup*, the analogue channel may interfere in the noise measurement (given that the noise level is measured at $f_{noise}=f_{tuning}$ - ½* *Channel BW* = 650 MHz - 4MHz = 646 MHz), so under this situation it is recommended to make the measurement in **Spectrum Analyser** mode and to define manually the frequency where we want to measure noise (obviously a frequency where no signal is present); i.e. in the next figure noise is defined to be measured at 655 MHz.

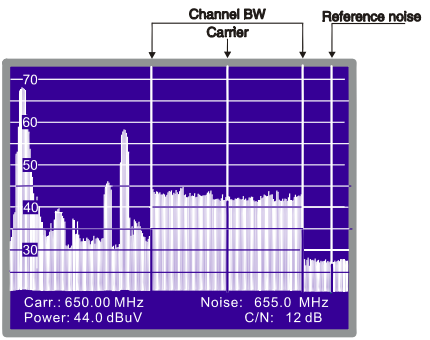

Figure 61.- Carrier to Noise measurement in Spectrum mode (digital channel).

To define the frequency to measure the noise, select the ***Reference noise*** function in the Spectrum functions menu and press the rotary selector. Next, again in the Spectrum mode, turn the rotary selector to place the marker on the frequency where you want to measure noise level or press key -/-- [31], current reference noise value will be erased and using the keyboard introduce the new value. Finally accede to the functions menu again and execute the ***Carrier*** function so that you can tune new carrier frequencies by turning the rotary selector.

When C/N measuring mode is selected, on the lower part of the image appears the tuned frequency/channel (***Carr***.), the noise frequency (***Noise***), the carrier ***Level*** (if analogue mode is selected) or the channel ***Power*** (if digital mode is selected) and the carrier to noise ratio (***C/N***).

4.10.2.3 Measuring the Power of Digital Channels *(Channel Power)*

In the Spectrum Analyser mode the **PROLINK-4/4C *Premium*** measures digital channel power using an **Integration method** between channel limits which are defined by the user. To show the interest of this method, imagine a spectral distribution like the one shown in the following figure (channel bandwidth is 8 MHz defined by the markers). If channel power is measured in TV operation mode different readouts will be obtained depending on the tuned frequency (measurement filter bandwidth is 230 kHz), if tuning is shifted from 759 MHz to 762 MHz reading will increase in several dB.

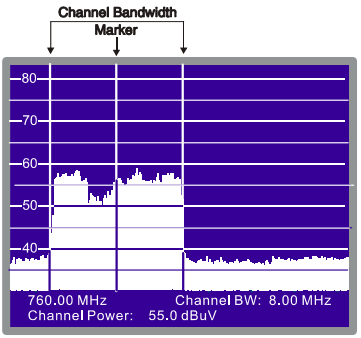

Figure 62.- Channel power measurement in Spectrum Mode.

When measuring Channel power, on the lower part of the image appears the tuned frequency (or channel), the channel bandwidth (***Channel BW***) and the ***Channel Power***.

To measure the channel power, first of all it is necessary to define channel bandwidth, that is to say to set the limits of the integration: select the ***Channel bandwidth*** function in the functions menu and then, again in the Spectrum mode, turn the rotary selector to modify it or well press key -/-- [31], current channel bandwidth will be erased and using the keyboard introduce the new value. Finally accede to the functions menu again and execute the ***Marker*** function in order you can tune new carrier frequencies, then when turning the rotary selector, the tuning marker and the channel bandwidth limits will shift together.

IMPORTANT REMARK

To measure digital channels power correctly it is indispensable to tune channel at its central frequency and to define ***channel bandwidth****.*

4.11 Selecting the Sound Mode (SOUND)

From the TV operating mode, analogue mode, press key 6 ♪ [26]. The screen will show the **SOUND** menu with the types of sound available. Turn the rotary selector [4], choose the type of sound you wish and then press key 6 ♪ [26] or the rotary selector [4] to activate it. Table 4 shows the different options for the sound mode.

English

Type	Function	Band
4.50	Sound carrier 4.5 MHz above the picture carrier	Terrestrial
5.50	Sound carrier 5.5 MHz above the picture carrier	Terrestrial
5.74	Selects the second carrier in DUAL or STEREO transmissions, at 5.74 MHz of the picture carrier	Terrestrial
5.80	Sound carrier 5.8 MHz above the picture carrier	Satellite
6.00	Sound carrier 6.0 MHz above the picture carrier	Terrestrial
6.50	Sound carrier 6.5 MHz above the picture carrier	Terrestrial Satellite
6.65	Sound carrier 6.65 MHz above the picture carrier	Satellite
7.02	Sound carrier 7.02 MHz above the picture carrier	Satellite
NTUN	Continuous tuning (4.00 a 9.00 MHz) with narrow sound detection filter (110 kHz)	Terrestrial Satellite
BTUN	Continuous tuning (4.00 a 9.00 MHz) with broad sound detection filter (240 kHz)	Terrestrial Satellite
NICA	NICAM decoding	Terrestrial
AM	AM demodulation	Terrestrial
FM	Demodulación FM	Terrestrial
LV	Tone whose frequency varies with the signal level	Terrestrial Satellite
OFF	Suppresses the sound	Terrestrial Satellite

Table 7.- Sound modes.

When you select the **NTUN** (continuous tuning using a narrow detection filter) and **BTUN** (continuous tuning using a broad detection filter) options the screen displays a window showing the **frequency deviation of the sound carrier**, this is variable between **4.00 MHz** and **9.00 MHz**. To define it turn the rotary selector [4] to the desired frequency deviation and press to validate.

4.11.1 FM function, access to RDS service

The function **FM**, allows to access to the information associated with the **Radio Data System** (**RDS**), in case of emitting in the frequency of selected demodulation. This technique offers data in the receiver screen relative to the identification of tuned transmitters network (**Service of Program** - **PS**), as well as after few seconds, short messages (**Radio TEXT - RT**), the program type (**PTY**), the traffic announcements (**TA**), the program identification (**PI**) and traffic program identification (**TP**) that emits each service.

The **PROLINK-4/4C *Premium*** also shows the level of the received signal and tuned **FM** frequency, as well as the balance of the number of received erroneous blocks (**EBB**). (See figure 63).

Figure 63.- RDS service information.

When pressing the key [2] takes place an update of the emission received data.

In order to exit FM function, select a measurement from SOUND menu by pressing the key [26].

4.11.2 Tone function

When the **LV** function is selected, the speaker of the **PROLINK-4/4C *Premium*** permits a tone whose frequency depends on the level of the signal received. This is very useful when installing antennas, since the user can locate the peak signal without having to look continually at the monitor of the level meter.

4.11.3 Selecting NICAM sound

When the **NICAM** option is selected, it is possible to measure the Bit Error Rate of the modulation. To obtain this measurement, from the **TV** operating mode, level measurement, press key [2] in order to activate the mode of maximum measurement information displayed on the screen (name assigned to memory, power supply to external units, sound, colour system, TV standard, level and frequency/channel). In the position relative to the type of ***Sound*** will appear the information about the type of NICAM according to:

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176
FAX 781.665.0780 - TestEquipmentDepot.com

Sound: Type + Error

Type = NICAM type:

"**--**":	no NICAM is detected
"**du**":	dual NICAM
"**st**":	stereo NICAM
"**mo**"	mono NICAM

Error = indication of the bit error rate:

"**E ↓**":	error rate < 1e-5
"**E5**":	1e-5 < error rate < 1e-4
"**E4**":	1e-4 < error rate < 1e-3
"**E3**":	1e-3 < error rate < 2.7 e-3
"**E ↑**":	error rate > 2.7 e-3

Therefore, for example, the indication **Sound: duE↓** has to be interpreted as NICAM sound is selected, the detected NICAM is **dual** and the error rate is below **1 e-5**.

4.12 Measurement Configuration Memories

To facilitate measurement, the **PROLINK-4/4C *Premium*** is able to store up to 99 configurations in an internal memory. In this way, it is possible to select the most common transmissions in a work area with their corresponding configurations quickly and easily.

The following parameters are stored in each configuration: the name assigned to the configuration, frequency or channel number, TV system, type of measurement, external units supply voltage (VLNB), measurement units, sound parameters, LNB-oscillator frequency, channel bandwidth (digital), symbol rate (digital), code rate (digital) and spectral inversion (digital).

The different measuring configurations can be retrieved with the **Datalogger** function, in order to conduct different data acquisitions in a completely automatic way and store them in the memory for later print-out or processing (see paragraph '*4.9.4.4 Datalogger function*').

It is possible to associate a specific measurement configuration with the execution of a previously edited DiSEqC program (see *'4.9.4.20 DiSEqC Commands Generator'*).

4.12.1 Storing a Measurement Configuration *(STORE)*

The process of storing a measurement configuration is the following:

1. Select the configuration you want on the **PROLINK-4/4C *Premium*** (freq./channel, band, etc.).

2. Press key [25] until the monitor displays the **STORE** screen. Check the configuration parameters. Then turn the rotary selector [4] to the memory number that you wish to store the configuration in (from 1 to 99). This number corresponds to the column headings of the Datalogger function.

   If a configuration is stored in a memory location already containing information, that data will be lost.

3. (Optional) If you wish to assign a name to a memory position press key -/-- [31], the first character of the name will blink, turn the rotary selector [4] and the different characters will appear in the first position of the configuration name. When you have chosen the first character press the rotary selector again [4] to automatically move on to the second character. Repeat the process for a maximum of four characters.

4. (Optional). When the equipment works in digital mode, press the key -/-- [31] to accede to the measurement function that you wish to set-up and select the parameter to store with the rotary selector [4]; BER or MER for QAM modulations; BER, CSI or MER for COFDM and MER, VBER (BER after Viterbi) or CBER (BER before FEC) for QPSK, and for DAB signals; CBER (Coded BER) and SNR.

5. (Optional) A memory position may be assigned to the name of a previously edited DiSEqC program, thereby associating it with the execution of the memorised measuring configuration.

   Whenever it is established a satellite configuration will appear the DiSEqC parameter. In order to activate it, accede by means of the key -/-- [31] and pressing the rotary selector [4] to view the list of edited programs (See section '*4.9.4.20 DiSEqC Command Generator*') and select the program to execute.

Figure 64.- STORE screen, storing a measuring configuration.

English

6. Finally, press [25] key or the rotary selector [4] and the configuration will be stored. If any other key is pressed, an error will be indicated and the memory will not be updated.

4.12.2 Retrieving a Configuration *(RECALL)*

Press the [25] key. The screen **RECALL** will appear on the monitor which shows the different parameters of each measuring configuration stored. Turning the rotary selector [4] select the configuration to be retrieved (a number between 1 and 99). Pressing the [25] key again or the rotary selector [4] will retrieve the configuration.

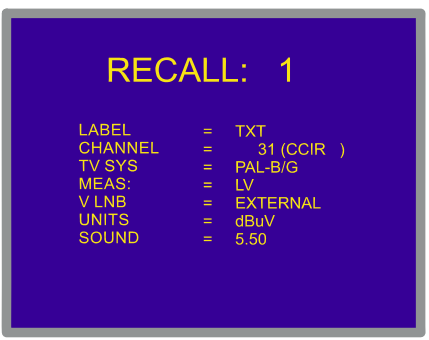

Figure 65.- RECALL screen, retrieving a measurement configuration.

4.13 Direct Access to Functions

Keys [28] and [29] give direct access to any of the functions on the TV and Spectrum Analyser mode functions menus. To establish a relationship between the direct access key and a function, access the functions menu, select the function you wish to access directly and press key [28] or [29]. From then on when you press key [28] or [29] the function will be accessed directly.

To directly execute a previously edited DiSEqC program, pressing the key assigned to the program will execute the memorised command.

4.14 Printing the Spectrum, the Measurements and Memories

By connecting the instrument to a serial printer it is possible to obtain the spectrum showed on screen or a printed report of a sequence of measurements just at the moment they are taken, or later, if they are recorded with the **Datalogger** function. This enables the user to keep a file about the state of the system and provide the documents related to the level measurements for analysis purposes. The **CI-23** portable printer is a **PROLINK-4/4C *Premium*** optional accessory.

The installation process consists of simply using the data transfer cable to connect the printer to the RS-232C connector [37] on the **PROLINK-4/4C *Premium*** (see section '*4.14.1 Handshake and control lines*'). Switch off the power to both instruments before connecting.

To print the spectrum showed select the function **Print** on the function menu in the **Spectrum Analyser mode**.

To print measurements select the **Datalogger** function on the functions menu (see section '*4.9.4.4 Datalogger function*'), access the configuration menu, activate the print field (*Print : On*) and switch on the printer. From now on the printing process is equivalent to taking measurements. The following figure shows an example of printing two activated columns (memories 1 and 2) and two activated rows (test points 1 and 2).

English

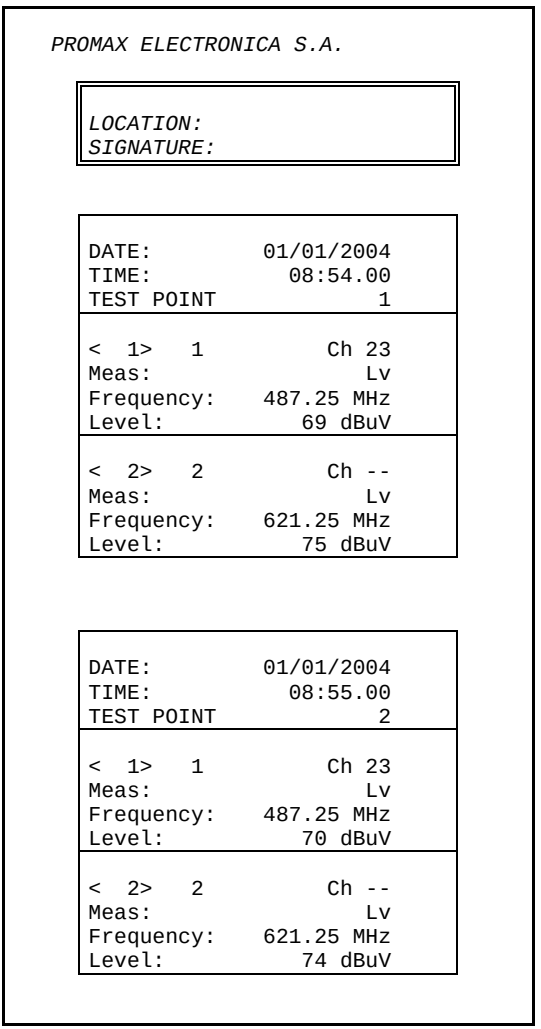

Figure 66.- Printing measurement

4.14.1 Handshake and Control Lines

Next is described the handshake and control lines used by the **PROLINK-4/4C *Premium***:

- The following parameters are used for printing through the serial port:

Rate:	**19,200 bauds**
Data bits:	**8 bits**
Parity:	**None**
Stop bits:	**1**

To modify the printer parameters see *4.14.2 CI-23 Set-up*.

- The control lines used are:
  - DATA TRANSMIT (PROLINK-4/4C ***Premium*** pin 3): To send data to the printer.
  - CLEAR TO SEND (PROLINK-4/4C ***Premium*** pin 8): Data transfer control. Data are sent only when this line is active.
  - DATA TERMINAL READY (PROLINK-4/4C ***Premium*** pin 4): This line is permanently active in order to indicate the establishment of the communication.

Connections

The cable between the **PROLINK-4/4C *Premium*** and the printer must have the following connections:

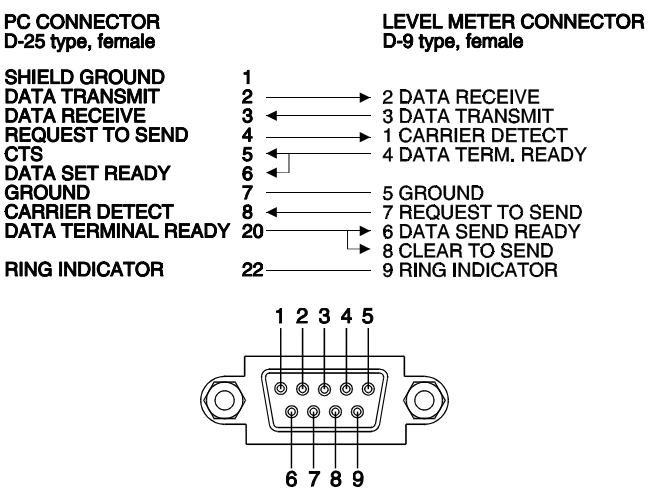

Figure 67.- Connector RS-232C **PROLINK-4/4C *Premium*.** Pins numbering.

English

4.14.2 CI-23 set-up

This point explains how to modify the **CI-23** printer set-up.

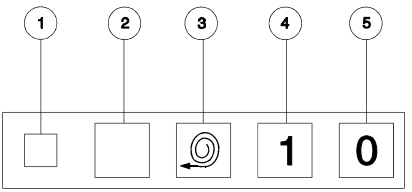

Figure 68.- CI-23 keyboard

[1] POWER LED [2] SET-UP [3] FEED [4] ON [5] OFF

To initiate the set-up mode push the **[2] SET-UP** and the **[4] ON** keys. The **[1] POWER ON** LED will flash until set-up mode is turned off. The current parameter status will be printed. The status of the DATA BITS parameter will be printed in order to modify it if necessary.

To select the status of the resting parameters (PARITY, BAUD-RATE, COUNTRY, PRINT MODE, AUTO-OFF, EMULATION and DTR) push the **[3] FEED** key. These parameters are selected in a sequential way. To modify the status of any parameter push sequentially the **[2] SET-UP** key. Example:

SERIAL BAUD RATE: 300, 600, 1200, 2400, 4800, 9600, 19200, 300...

When all the necessary changes have been made, push the **[2] SET-UP** and **[3] FEED** keys to update the configuration of the printer. If no key is pressed for 15 seconds the set-up mode will be terminated without changing the original parameters.

```
PROGRAMME-MODE
Present setting are:-


Data bits  :-         8
Parity     :-      Nome
Baud-rate  :-     19200
Country    :-      U.K.
Print mode :-      Text
Auto-off   :-    5 Min.
Emulation  :-  Standard
DTR        :-    Normal
```

Figure 69.- CI-23 setup

5 DESCRIPTION OF THE INPUTS AND OUTPUTS

5.1 RF input

The RF input is through the RF [37] connector on the side panel. The peak signal level should never exceed 130 dBμV.

5.2 RS-232C serial port

The **PROLINK-4/4C *Premium*** incorporates an RS-232C serial port for data exchange with a PC, a serial printer (i.e. our model **CI-23**) or to other devices. The signals in this connector are described in Table 7.

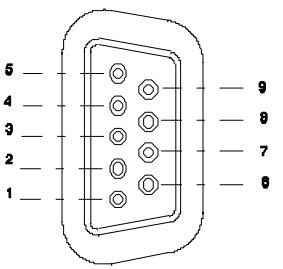

Figure 70.- RS-232C connector. External view.

PIN No.	SIGNAL	CHARACTERISTICS
1	Carrier detect	(not connected)
2	Data Receive (RxD)	
3	Data Transmit (TxD)	
4	Data Terminal Ready (DTR)	Fixed at +12 V
5	Ground (GND)	
6	Data Set Ready (DSR)	(not connected)
7	Request to Send (RTS)	
8	Clear to Send (CTS)	
9	Ring Indicator	(not connected)

Table 8.- Description of the RS-232C connector.

5.3 Parallel Input Connector (LVDS D-25)

Direct input of Transport Stream MPEG-2 / DVB LVDS (*Low Voltage Differential Signaling*) signals.

Data input speed	Maximum: 60 Mbits/s Minimum: 1Mbits/s

English

Signal amplitude	Maximum: 2.0 Vpp Minimum: 100 mVpp
Terminal impedance	100 Ω resistive

5.4 Parallel Output Connector (LVDS D-25)

Output consisting of MPEG-2 / DVB Transport Stream signals corresponding to the RF signal reaching the instrument.

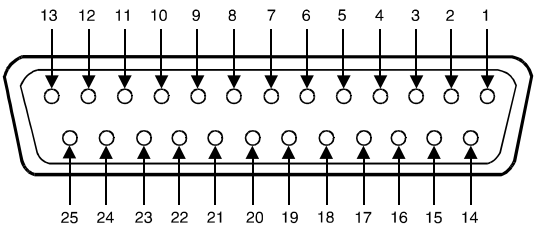

Figure 71.- Parallel Connector (**LVDS** D-25). External view.

The signals running through this connector are the following:

PIN number	SIGNAL	CHARACTERISTICS
1	DCLK	Clock for data word
2	GND	Ground
3	DATA 7Data	bit 7 (MSB)
4	DATA 6	Data bit 6
5	DATA 5	Data bit 5
6	DATA 4	Data bit 4
7	DATA 3	Data bit 3
8	DATA 2	Data bit 2
9	DATA 1	Data bit 1
10	DATA 0	Data bit 0 (LSB)
11	DVALID	Valid data word
12	PSYNC	Packet sync.
13	Shield	Ground
14	DCLK	Clock for data word, inverted
15	GND	Ground
16	DATA 7	Data bit 7 (MSB), inverted
17	DATA 6	Data bit 6, inverted
18	DATA 5	Data bit 5, inverted
19	DATA 4	Data bit 4, inverted
20	DATA 3	Data bit 3, inverted
21	DATA 2	Data bit 2, inverted
22	DATA 1	Data bit 1, inverted
23	DATA 0	Data bit 0 (LSB), inverted

24	$\overline{\text{DVALID}}$	Valid data word, inverted
25	$\overline{\text{PSYNC}}$	Packet sync., inverted

Table 9.- Description of the Parallel Connector (**LVDS D-25**).

5.5 Scart (DIN EN 50049)

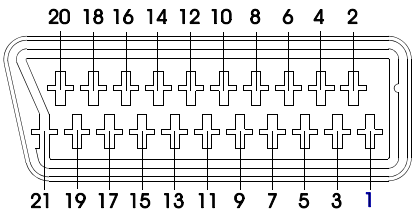

Figure 72.- Scart socket (external view).

Also known as PERITEL connector (in conformity with standard NF-C92250). The signals in this connector are the following:

PIN number	SIGNAL	CHARACTERISTICS
1	Right channel audio output	
2	Right channel audio input	
3	Left channel audio output	
4	Audio grounding	
5	Blue grounding (B)	
6	Left channel audio input	
7	Blue output (B)	
8	Switching voltage	
9	Green grounding (G)	
10	Digital bus interface	(not connected)
11	Green output (G)	
12	Digital bus interface	(not connected)
13	Red grounding (R)	
14	Digital bus reserved	(not connected)
15	Red output (R)	
16	Blanked signal	(not connected)
17	Composite video grounding	
18	Blanked return	(not connected)
19	Composite video output	
20	Video input	
21	Connector shield grounding	

Table 10.- Description of the Scart.

English

5.6 Connector for CAM modules and SMART-Cards

Enables the conditional access (disencryption) of encoded digital TV signals, in agreement with the **DVB-CI** (*Common Interface*) recommendation.

This technology supports all those disencryption systems for which a valid **CAM** module exists, according to **DVB-CI**, with the corresponding subscriber card.

The **PROLINK-4/4C *Premium*** by means of **Common Interface** method offers the possibility of supporting various conditional access systems, so that video and/or audio broadcast by encrypted services (ciphered, pay TV) may be decoded following the **SimulCrypt** model. It provides a standard connector to insert **CAM** modules (Conditional Access Module), that allows a specific management of each codification system.

SimulCrypt is a process offering the use of various parallel conditional access systems, together with the encryption algorithms specified by **DVB-CSA** (*Common Scrambling Algorithm*) to control access to pay-TV services. The **Transport Stream** of **SimulCrypt** broadcasts contains the keys for various conditional accesses, thereby allowing reception by more than one type of decoder.

The user simply needs to insert the subscriber Smart -Card in the **CAM** module connector designed for this purpose before or after the instrument has acquired the list of services and an encrypted service is then selected. After a few seconds, the image and/or sound will have to appear.

In order to insert or to change a **CAM** module, follow next procedure:

- The **CAM** module connector [42] is located on the equipment upper panel. Place the instrument on a stable surface and insert the module so the printed arrow appears on visible upper face, until the button from extractor mechanism [43] becomes activated.

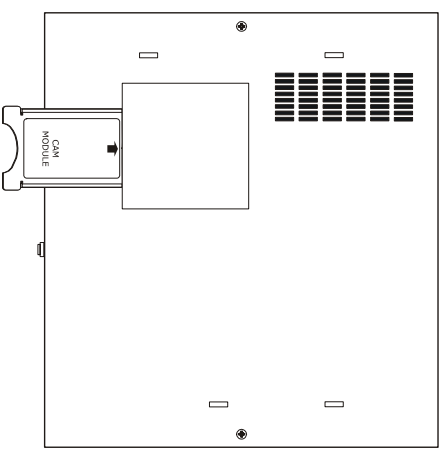

Figure 73.- CAM module insertion.

- Insert the subscriber card into the **CAM** module connector [42] being followed the direction that indicates the arrow printed on the card.

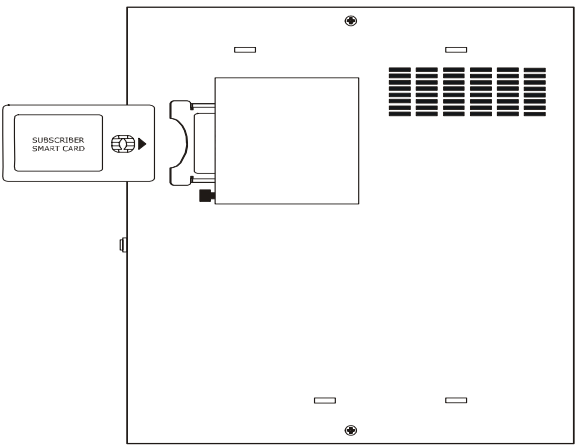

Figure 74.- Subscriber Smart-Card insertion.

- To extract an inserted **CAM** module, press the button from extractor mechanism [43] and remove the module.

IMPORTANT REMARK

The insertion of a CAM module or a SMART-CARD in a wrong position might produce the instrument malfunction and could generate damages to the equipment.

English

6 MAINTENANCE

6.1 Considerations about the Screen *(model PROLINK-4C Premium)*

This paragraph offers key considerations regarding the use of the colour screen, taken from the specifications of the manufacturer.

In the TFT display, the user may find pixels that do not light up or pixels that are permanently lit. This should not be regarded as a defect in the TFT. In accordance with the manufacturer quality standard, 9 pixels with these characteristics are considered admissible.

Pixels which are not detected when the distance from the surface of the TFT screen to the human eye is greater than 35 cm, with a viewing angle of 90º between the eye and the screen should not be considered manufacturing defects either.

It is advisable a viewing angle of 15º in the 6.00 o'clock direction in orden to obtain the optimum visualization of the screen. See following figure.

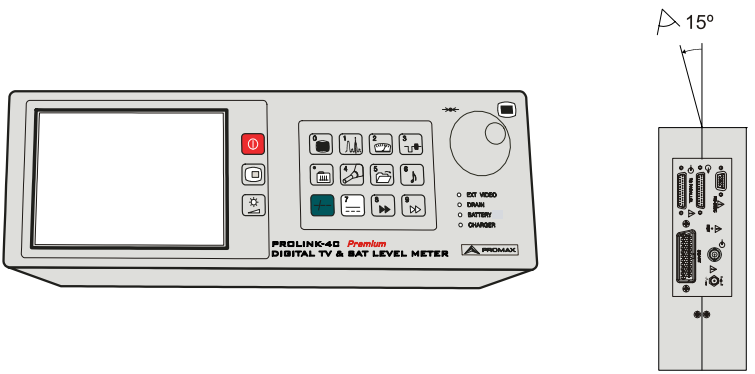

Figure 75.- Optimum viewing of the screen.

6.2 Internal fuses which user cannot replace

The following fuses are found on the base board. Their location identifier and characteristics are the following:

F001 and F002	**7 A**	**S**	**125 V**	**SMD**

English

6.3 Replacing the Battery

Battery must be replaced whenever the capacity of the fully-charged battery is noticeably diminished. To change the battery, follow next procedure:

IMPORTANT REMARK

In case of the battery appears to be damaged, you must send the equipment to an authorised Technical Service without trying to replace it.

Replace the old battery by another CB-044 battery. The battery can be bought in your habitual PROMAX supplier. Explosion or fire hazard can occur if other battery type is used.

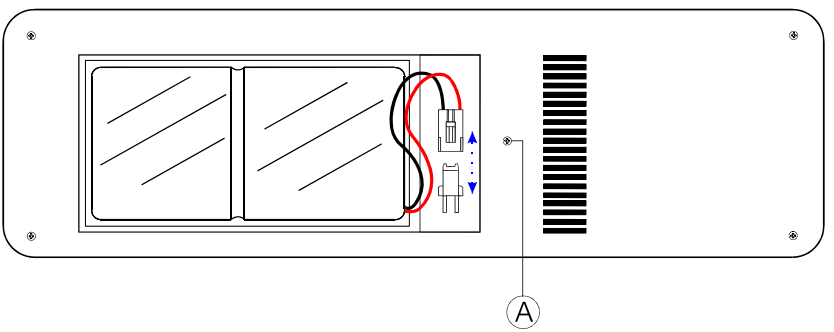

Figure 76.- Battery compartment.

CAUTION

The battery used can present fire or chemical burn hazard if it is severely mistreat.

Do not disassembly or cremate or heat the battery above 100 ºC under no circumstances.

- Switch off the instrument.
- Remove the rear holster, if in place.
- The battery compartment is located in the rear panel of the instrument. Remove the securing screw (**A**) and washer from the compartment cover as shown in the previous figure (it shows the battery compartment once the cover and connector linking the battery to the board have been removed).
- Disconnect the battery connector strip from the board, and replace the battery with a new.

IMPORTANT NOTICE

The configuration data and all data stored in the memories will be lost when the battery is disconnected.

- Place and connect the battery to the board using the connector.

WARNING

Avoid any type of short circuit among the cables connected to the battery, since the resulting high current may cause serious damage to the instrument.

- Insert the battery compartment cover in the rear panel of the **PROLINK-4/4C *Premium*** and lock in place with the securing washer and screw (**A**).
- If you wish, replace the holster.

CAUTION

All the components of the Lithium-ion battery included in the CB-044 ensemble are recyclable. Return as soon as possible the used battery to PROMAX ELECTRONICA S.A. or to an authorised recycling centre of this type of batteries. If any doubt, consult directly PROMAX ELECTRONICA,S.A.

Keep them out of the reach of the child.

If in any doubt, please contact our Customer Service Centre before undertaking any operation.

6.4 Cleaning Recommendations

CAUTION

To clean the cover, take care the instrument is disconnected.

CAUTION

Do not use scented hydrocarbons or chlorized solvents. Such products may attack the plastics used in the construction of the cover.

The cover should be cleaned by means of a light solution of detergent and water applied with a soft cloth.

Dry thoroughly before using the system again.

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176

FAX 781.665.0780 - TestEquipmentDepot.com